

Cisco FlexFlash: Use and Manage Cisco Flexible Flash Internal SD Card for Cisco UCS C-Series Standalone Rack Servers

White Paper
August 2013



What You Will Learn

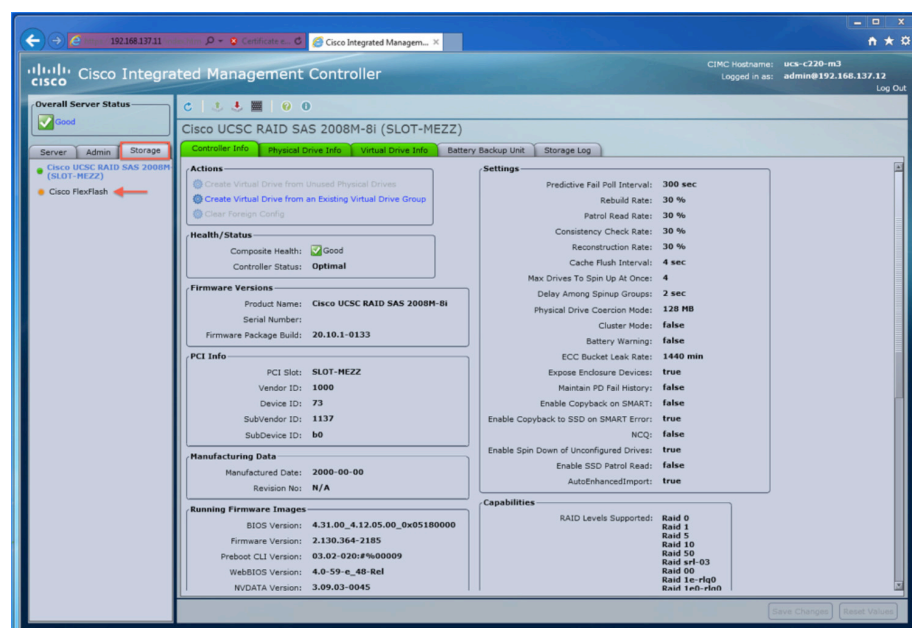
The Cisco UCS® C220 M3, C240 M3, C420 M3, and C260 M2 Rack Servers have transitioned from traditional internal optical drives to an internal Secure Digital (SD) card flexible flash memory device. This onboard SD card, called Cisco FlexFlash, has multiple drive partitions and allows users access to utilities and drives without the use of virtual media (vMedia) or an optical drive. This document describes the use and management of Cisco® FlexFlash drives using Cisco UCS C-Series Integrated Management Controller (IMC) version 1.5(1) or higher in standalone mode.

Verifying the Presence of Cisco FlexFlash

Before using the Cisco FlexFlash partitions in your server, you must first determine whether the SD card has been installed in your system. To verify installation, navigate to Cisco IMC by opening a web browser and entering the management IP address of the server in the URL section of the browser software.

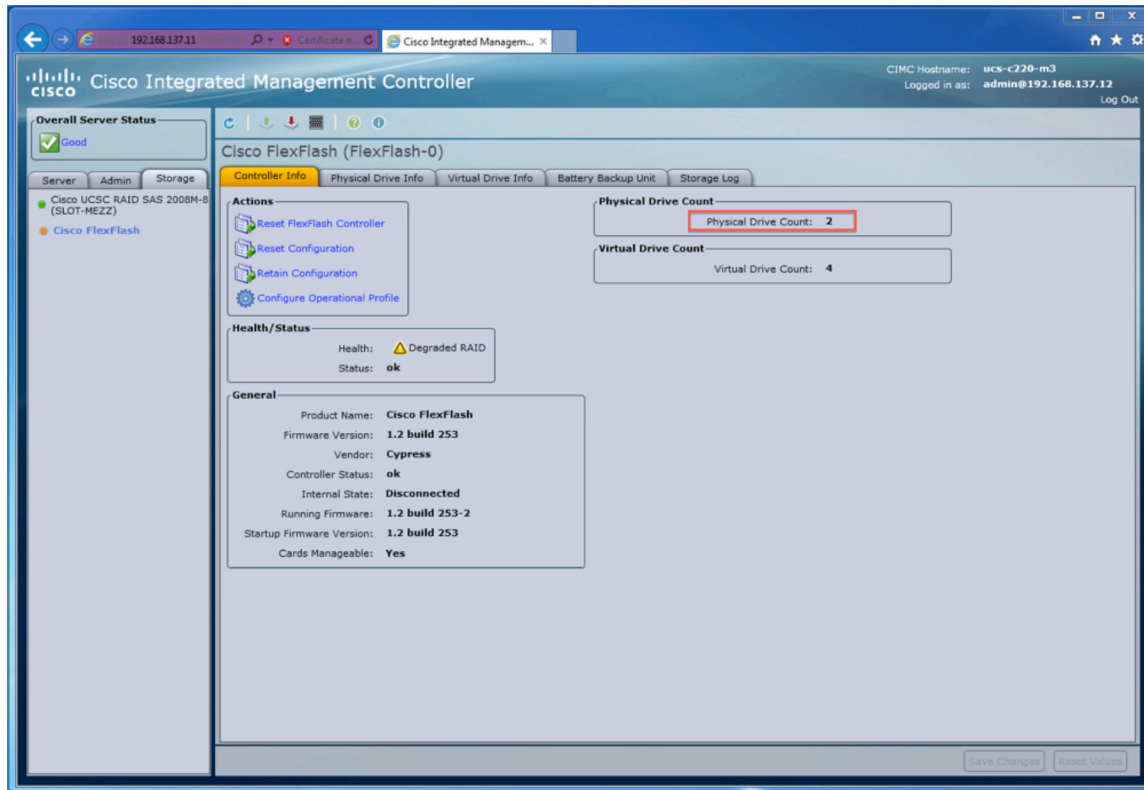
After logging in to Cisco IMC, select the Storage tab in the left pane of the browser. This will open the storage management section of Cisco IMC. (If no Storage tab is present, the system is running Cisco IMC firmware earlier than 1.5(1).) Select the Cisco FlexFlash controller in the left pane, as indicated by the arrow in Figure 1.

Figure 1. Storage Tab in Cisco IMC



This will open the controller pane on the right; the Controller Info tab will be shown by default. If any SD cards are installed in the system, the Physical Drive Count value shown in the right pane will be 1 or 2, as shown in Figure 2. If the Physical Drive Count is 0, there are no SD cards installed. With two SD cards installed, Cisco IMC supports a mirror (RAID 1) of the hypervisor (HV) partition only. This capability will be explained in more detail in a later section of this document.

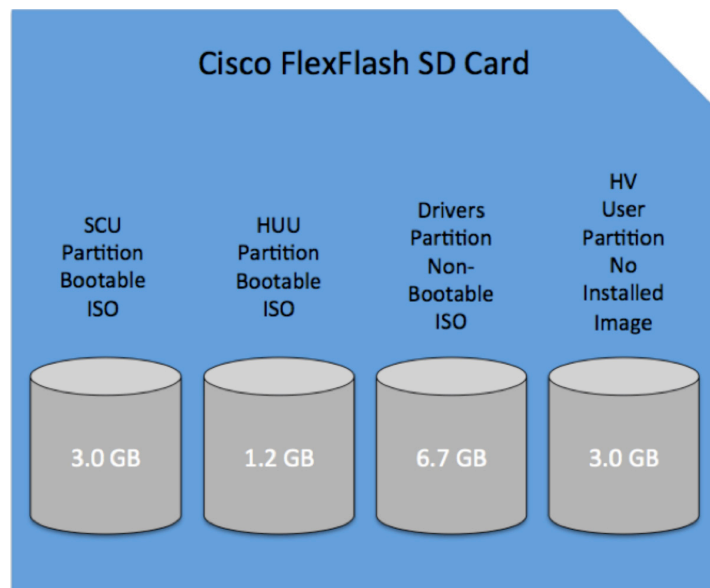
Figure 2. Cisco FlexFlash Controller Information in Cisco IMC



Understanding the Various Cisco FlexFlash Partitions

The Cisco FlexFlash SD card has four partitions, as shown in Figure 3. Each partition is presented as a USB drive to the BIOS and to any installed OS.

Figure 3. Cisco FlexFlash Logical Partitions



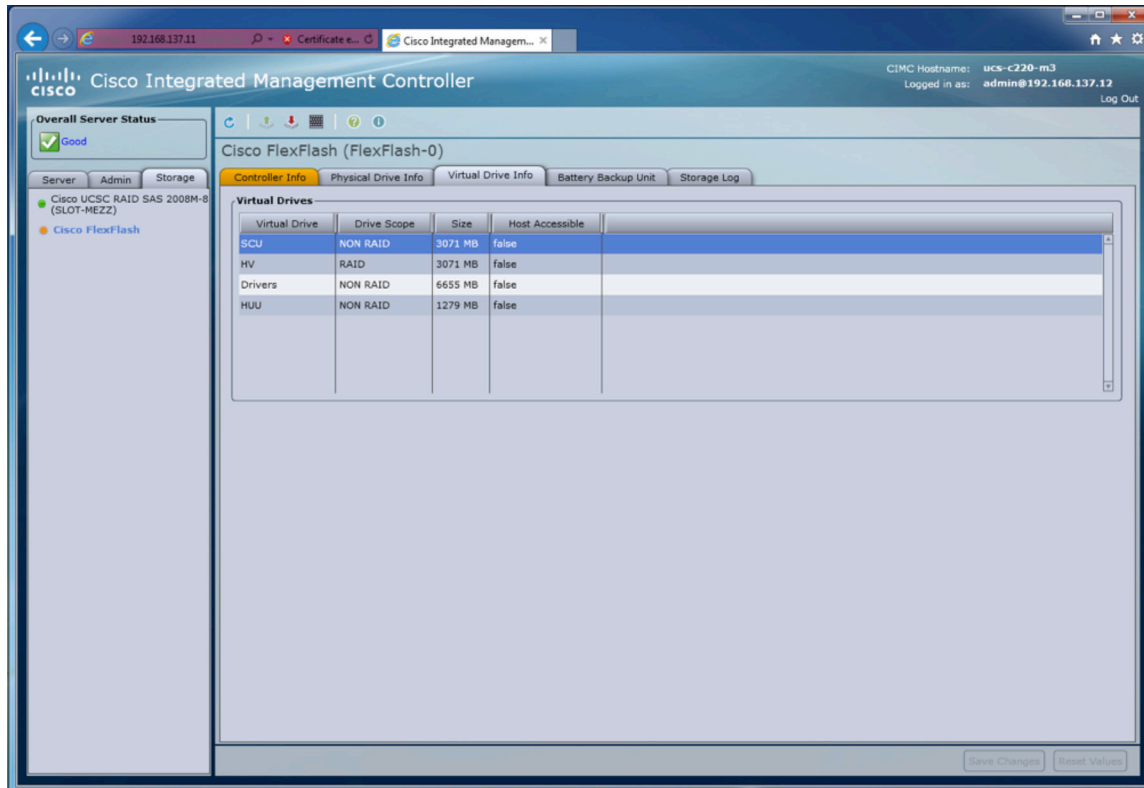
Note:

- SCU: Server Configuration Utility (bootable ISO); 3.0-GB user read-only space
- HUU: Host Upgrade Utility (bootable ISO); 1.2-GB user read-only space
- Drivers: Cisco Drivers ISO; 6.7-GB user read-only space
- HV: Hypervisor (bootable if made so by user); 3.0-GB user read-write space

The HUU, SCU, and Drivers partitions are preloaded by Cisco before shipping when the card is ordered as part of a system. If the SD card is ordered as a spare or received as part of a return materials authorization (RMA), it will not have any of the utility ISOs installed. The images on the partitions can be installed or updated by using SCU Release 3.1 or later, as described later in this document. Use of these system partitions for anything other than the specified purpose is not supported by Cisco.

You can view these partitions on the Virtual Drive Info tab, shown in Figure 4. This tab lists the scope of redundancy (RAID) for each partition and the size of each partition and indicates whether the partition is accessible by the BIOS and host (true).
Note: The Drive Scope indicates only which partitions will be mirrored when there is a healthy RAID synchronization between two SD cards installed in the system.

Figure 4. Cisco FlexFlash Virtual Drives



The screenshot shows the Cisco Integrated Management Controller (CIMC) web interface. The top navigation bar includes the Cisco logo and the title "Cisco Integrated Management Controller". The right side of the bar shows the CIMC Hostname: ucs-c220-m3, Logged in as: admin@192.168.137.12, and a Log Out button. The left sidebar displays the "Overall Server Status" as "Good" and lists storage options: "Cisco UCSC RAID SAS 2008M-8 (SLOT-MEZZ)" and "Cisco FlexFlash". The main content area is titled "Cisco FlexFlash (FlexFlash-0)" and contains a tabbed interface with "Controller Info", "Physical Drive Info", "Virtual Drive Info", "Battery Backup Unit", and "Storage Log". The "Virtual Drive Info" tab is active, showing a table of virtual drives.

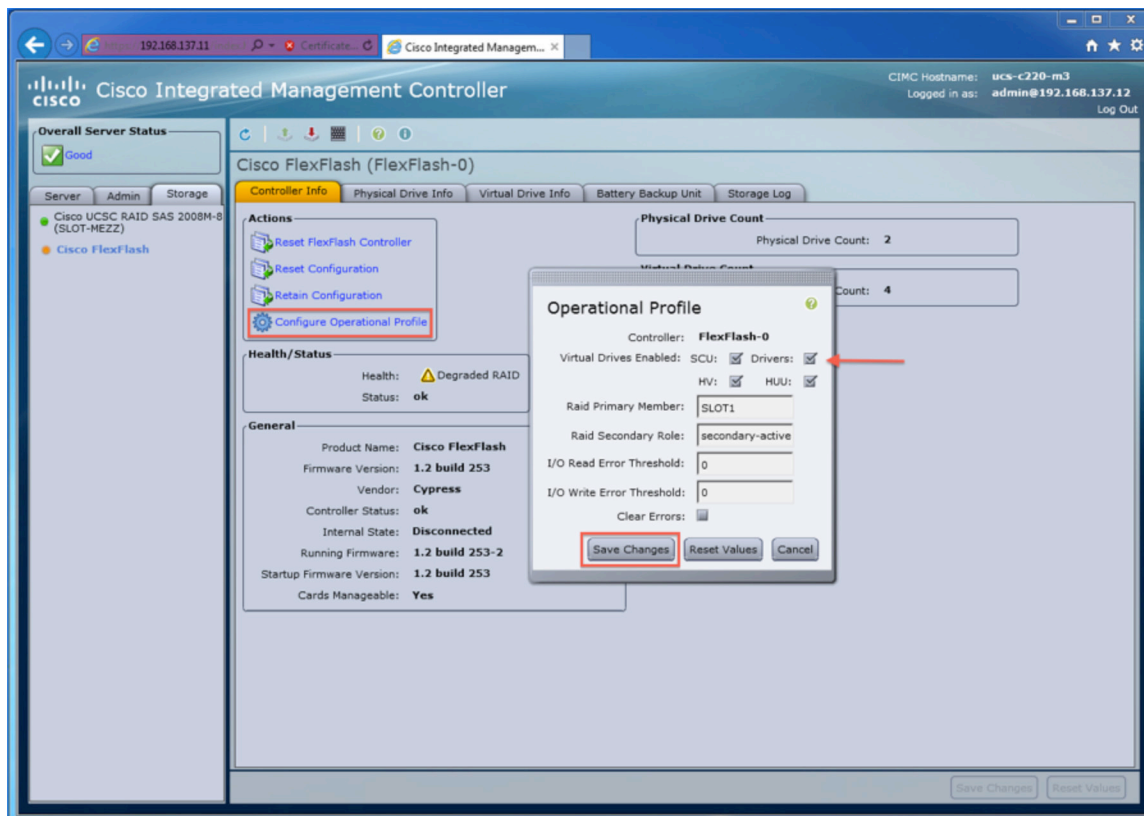
Virtual Drive	Drive Scope	Size	Host Accessible
SCU	NON RAID	3071 MB	false
HV	RAID	3071 MB	false
Drivers	NON RAID	6655 MB	false
HUU	NON RAID	1279 MB	false

At the bottom right of the main content area, there are two buttons: "Save Changes" and "Reset Values".

Activating Partitions on Cisco FlexFlash

Each partition presents itself to the BIOS as a USB hard drive. For these partitions to be visible, you must enable them through Cisco IMC. To activate a partition, select the Controller Info tab and click Configure Operational Profile. The Operational Profile dialog box will open, as shown in Figure 5. By default, all the partitions will be enabled from the factory. To enable or disable a partition, click the box to select it, and then click Save Changes. When at least one partition is enabled, the Internal State in the General section of the Controller Info tab will be Connected.

Figure 5. Configuring the Operational Profile



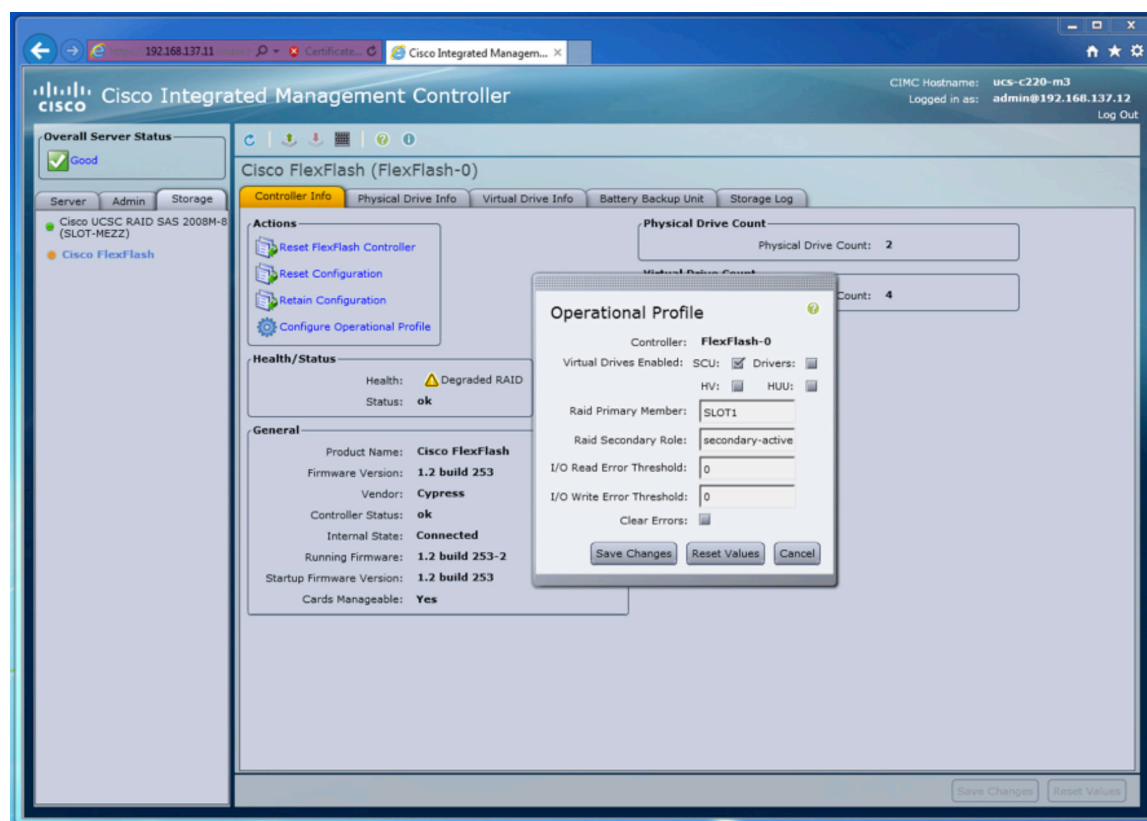
Note: After you enable the partitions, they will be visible to any operating system and the BIOS. The only time you would need to reboot is if you chose to boot from one of these spaces after it is enabled.

Booting the Utilities from Cisco FlexFlash

The SCU and HUU partitions contain the bootable ISO for each of these utilities. The SCU provides a GUI that can be used to install supported Microsoft Windows or Linux distributions on a Cisco UCS C-Series server and to slipstream the latest drivers for the server during the installation. In addition to providing a user-friendly installation of the OS, the SCU has a suite of diagnostic tools that can help you troubleshoot the server, including a tool for repairing and updating Cisco FlexFlash. The HUU provides an interactive interface that allows users to update the server BIOS, Cisco IMC firmware, and adapter firmware on the server.

To boot a utility from Cisco FlexFlash, you must first enable the partition in the operational profile in Cisco IMC by selecting the partition, as shown in Figure 6.

Figure 6. Enabling a Partition in Cisco IMC

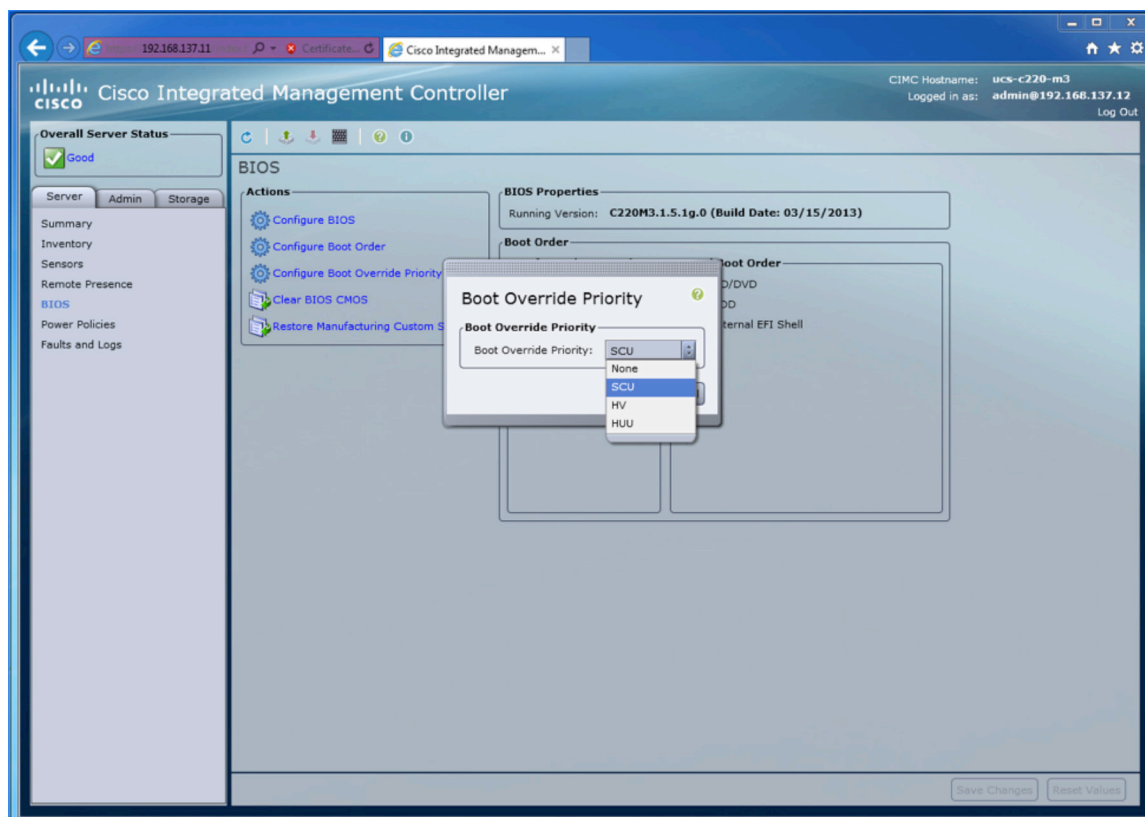


After you enable the partitions, you will be able to access them from the BIOS for boot or, in the case of the HV partition, for installation of a bootable image. Several options are available for booting from the partition, depending on the persistence and the level of user interaction, including options to override boot from Cisco IMC, select the BIOS boot menu during the power-on self-test (POST), or modify the second-level boot order for the hard drives in the BIOS setup.

Using Boot Override

Boot override is a one-time boot setting in Cisco IMC that allows you to boot from a Cisco FlexFlash partition without having to reconfigure the second-level boot order in the BIOS or press F6 during the POST process to select the BIOS boot menu. This option allows administrators to boot to a utility partition such as the SCU or HUU and then, after exiting, resume normal boot operations. This process prevents the accidental configuration of an incorrect boot parameter and eliminates the need for the administrator to watch the POST to select the boot device manually. To use the boot override option, choose the Server tab in the left pane of Cisco IMC and then click to display the BIOS pane. In the Actions section, select Configure Boot Override Priority. Choose a partition for a one-time boot override, as shown in Figure 7; then click OK to confirm the action.

Figure 7. Configuring Boot Override

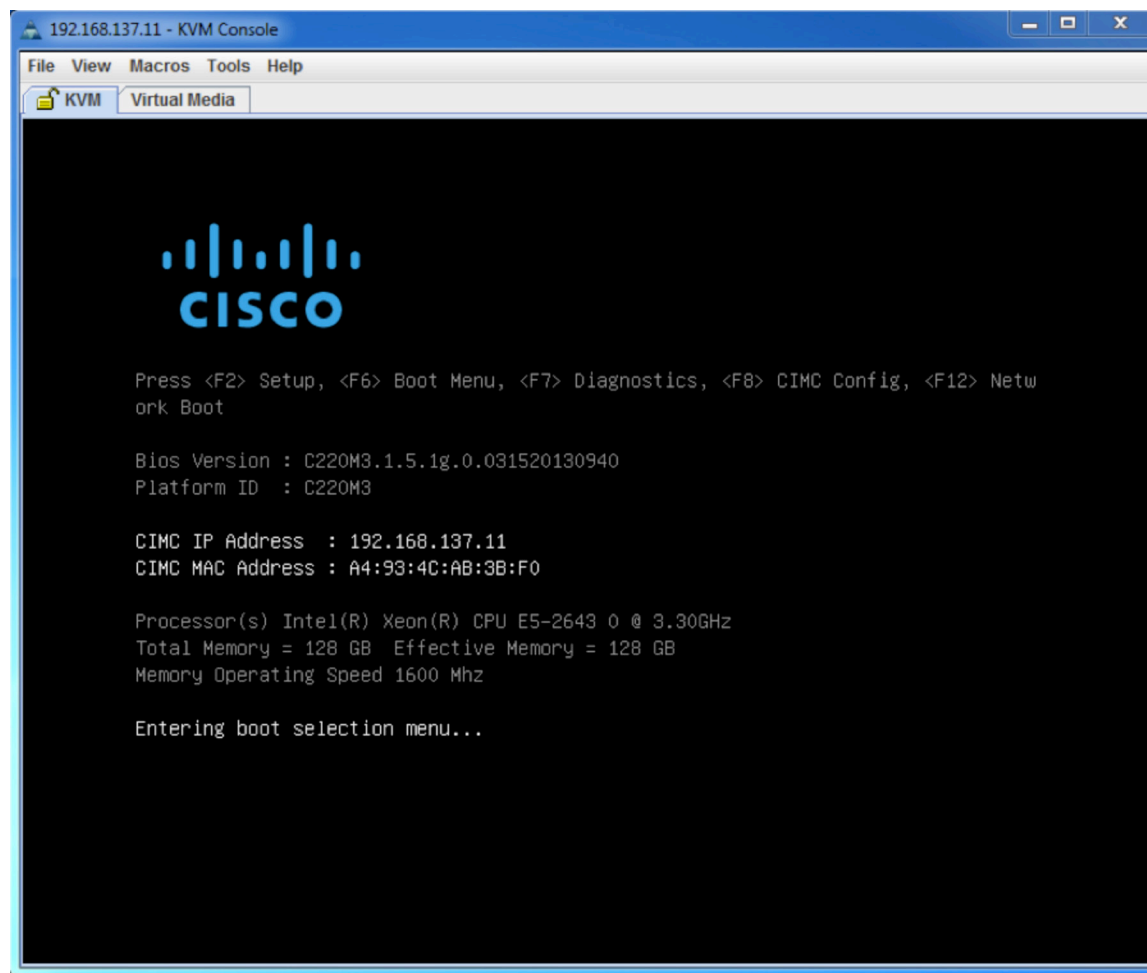


Reboot the server from the Summary section of Cisco IMC, and the server will boot to the selected partition if it has been enabled as discussed in the previous section.

Using the BIOS Boot Menu

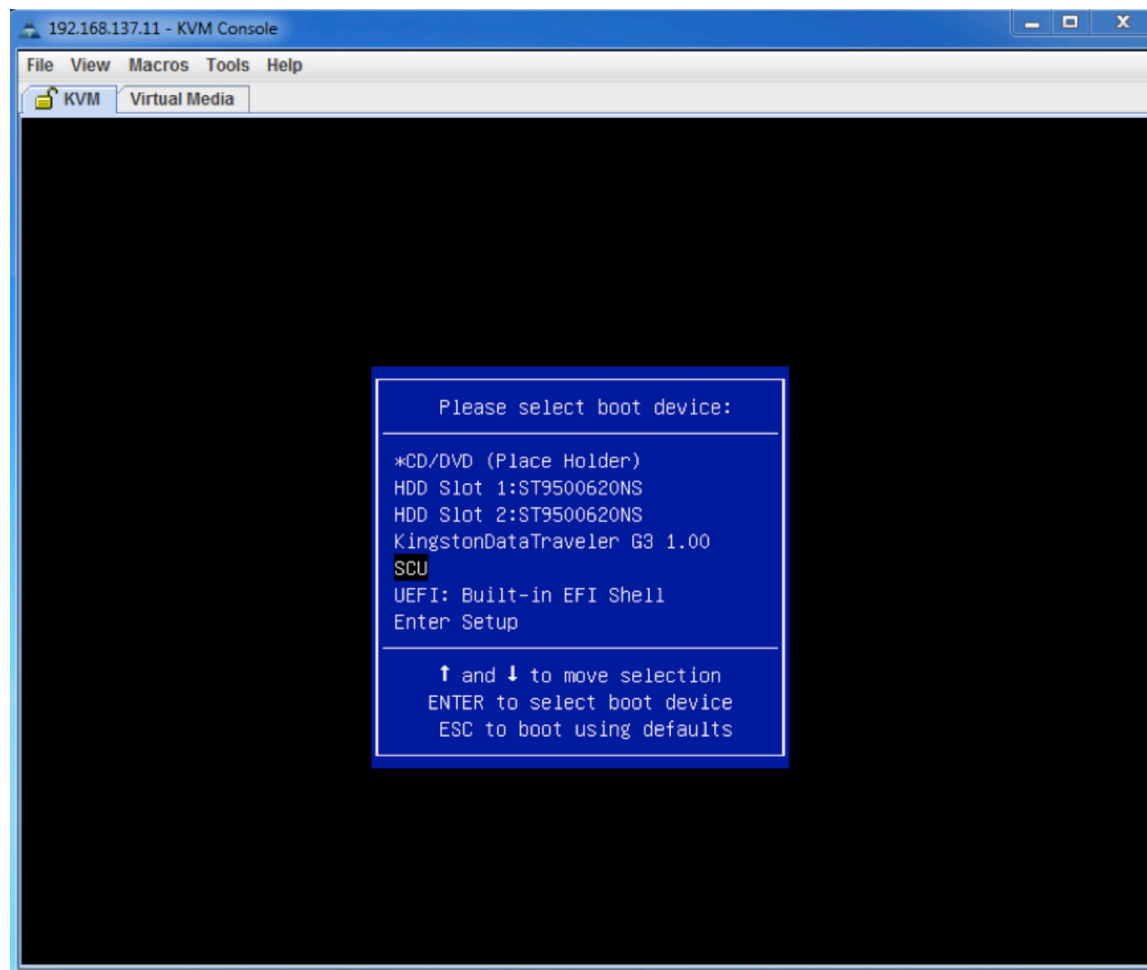
You can always choose a boot device using the BIOS F6 boot menu. This process requires a virtual or physical keyboard, video, and mouse (KVM) device connected to the console and administrator interaction during boot. To boot from the SCU using the BIOS boot menu, establish a virtual KVM connection to the server using the vKVM tool in Cisco IMC. Reboot the server using the reboot option in Cisco IMC and watch the KVM console. When the BIOS selection screen, shown in Figure 8, is displayed, press F6 to enter the BIOS boot menu.

Figure 8. BIOS Selection Screen



After the POST operation is complete, you will be presented with the boot selection menu. From the menu, choose the partition that you want to use for a one-time boot override. Only partitions that have been activated in Cisco IMC will be displayed. To boot the SCU, choose SCU from the list of boot devices, as shown in Figure 9, and press Enter.

Figure 9. Boot Selection Menu

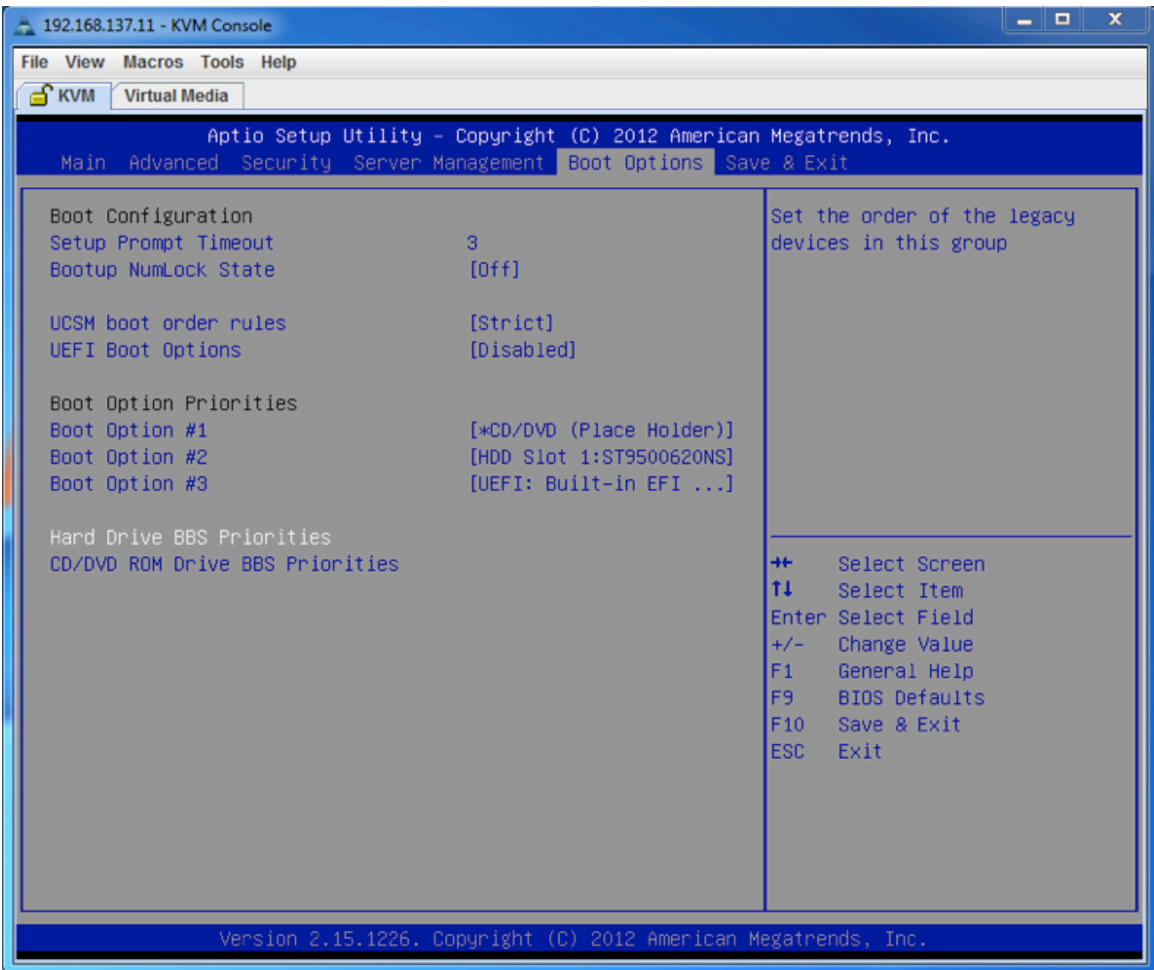


Configuring the Boot Order in the BIOS Setup

To configure a persistent boot order, you need to configure the boot order in the BIOS. Boot order can be configured from Cisco IMC. However, every SD partition, USB drive, and hard drive partition is presented to the BIOS at a second-level hard drive boot order. Currently, Cisco IMC provides only first-level boot order configuration—for example CD/DVD, HDD, or EFI Shell. To set the second-level boot order, you need to use the BIOS setup utility during boot. To configure the boot order, you need to enter setup mode by pressing F2 on the BIOS selection screen, as shown earlier in Figure 8.

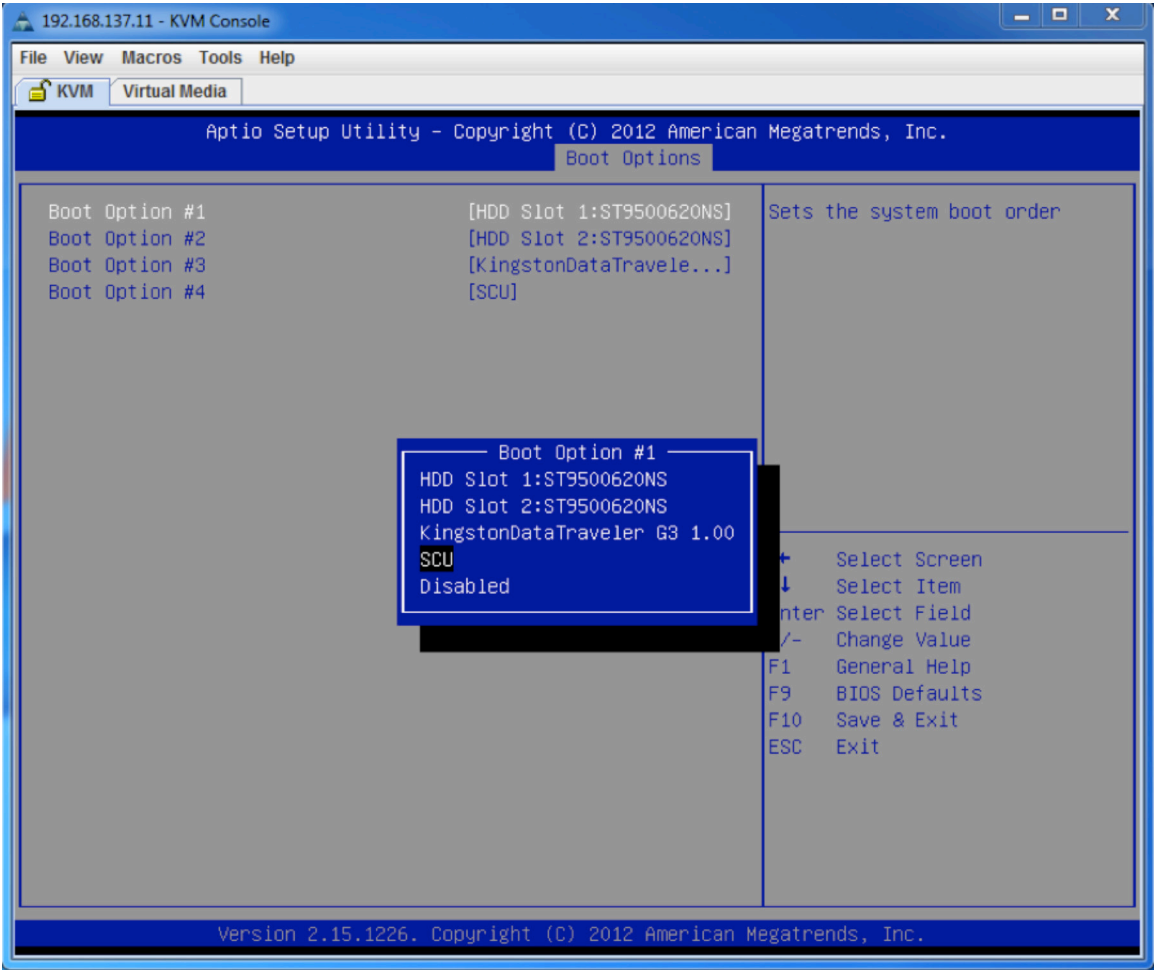
After you access the BIOS setup utility, select Boot Options from the top-level menu. In the Boot Options menu, select Hard Drive BIOS Boot Specifications (BBS) Priorities and press Enter, as shown in Figure 10.

Figure 10. Hard Drive Boot Priorities



A list of boot options will be displayed. This list will contain all the hard drive boot options that are available to the BIOS. If all the Cisco FlexFlash partitions are enabled, they will be listed here. To make a particular partition or drive the first bootable device, select Boot Option #1 and press Enter. A list of all the boot options will be displayed. Select the device that you want to be used first and press Enter, as shown in Figure 11. After completing the selection of the boot order, press F10 to save the configuration.

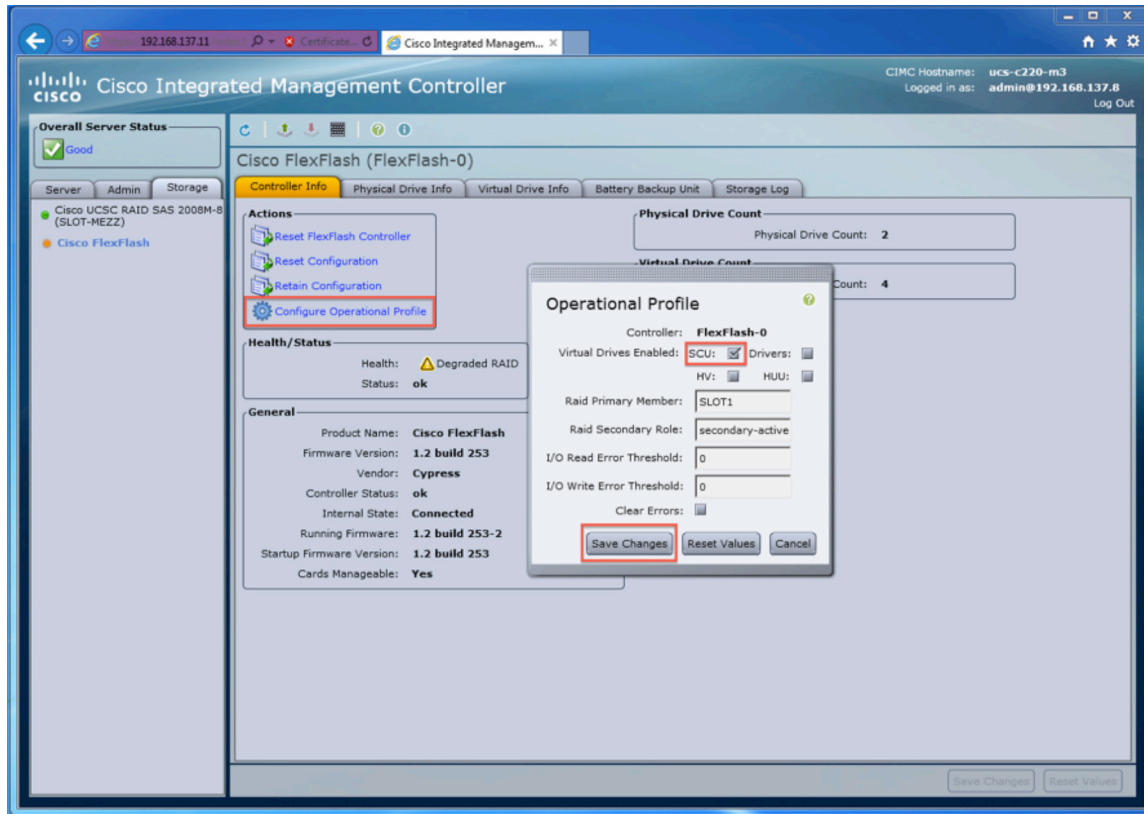
Figure 11. Second-Level Hard-Drive Boot Options



Booting the Server Configuration Utility from Cisco FlexFlash

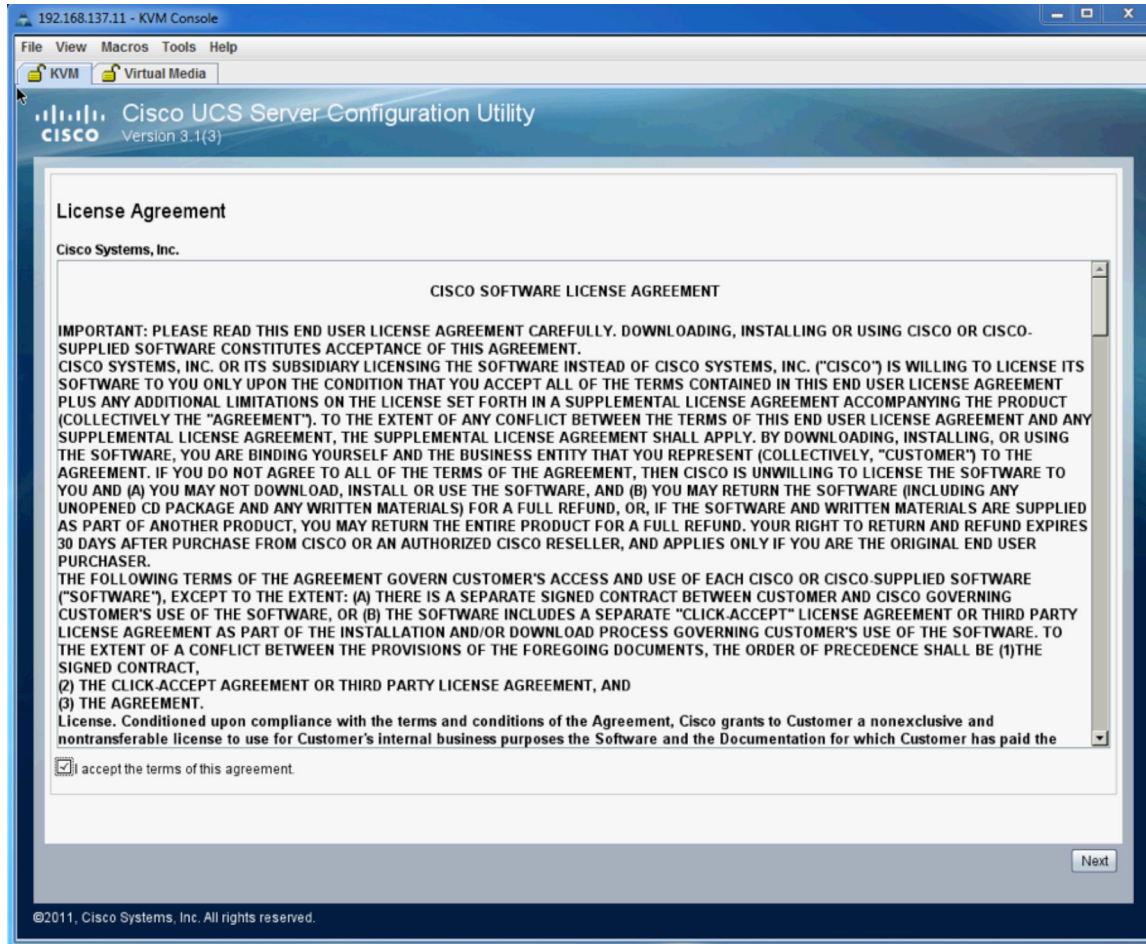
When you choose the SCU partition as the boot device, the system will load the SCU ISO from the partition. The SCU provides a set of inventory, setup, diagnostic, and Cisco FlexFlash utilities. You must first enable the SCU partition in Cisco FlexFlash, as shown in Figure 12.

Figure 12. Enabling the SCU Partition



Now select that partition for boot using one of the methods described previously. The software will load, and you will be prompted to accept the end-user license agreement (EULA), as shown in Figure 13.

Figure 13. SCU EULA

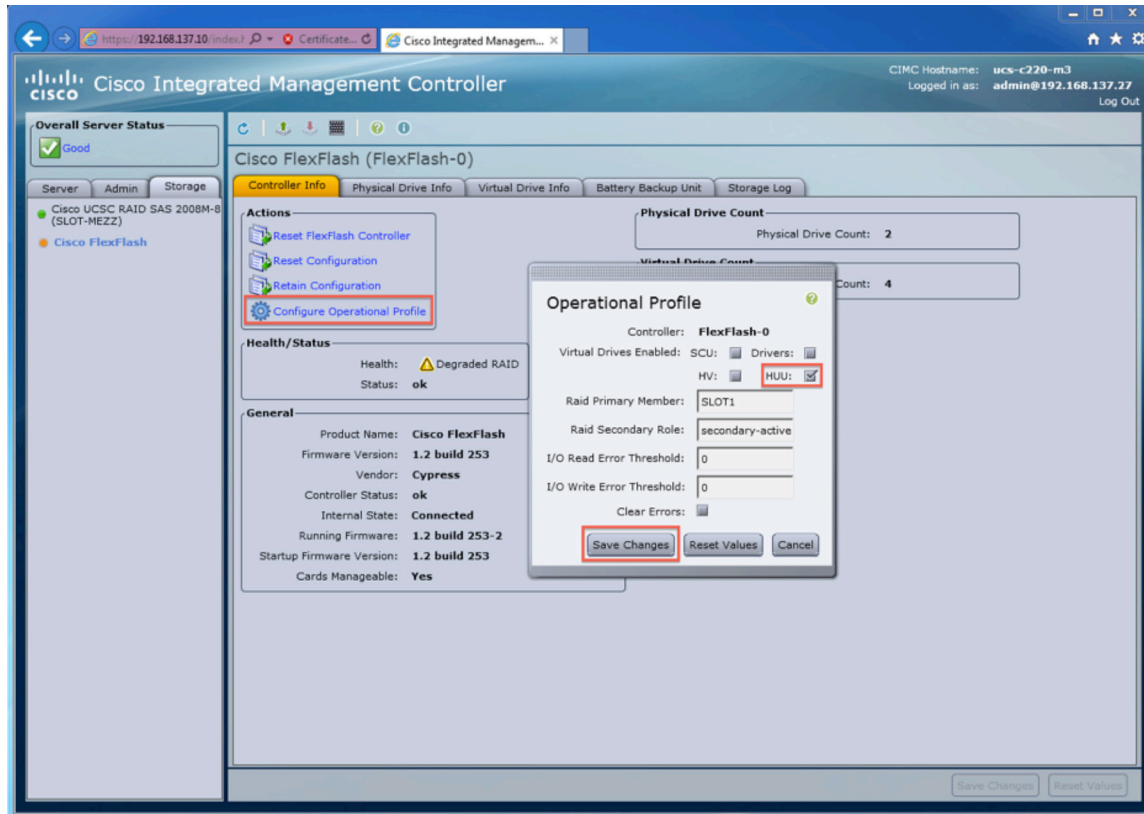


After you accept the EULA, the SCU will open for use.

Booting the Host Upgrade Utility from Cisco FlexFlash

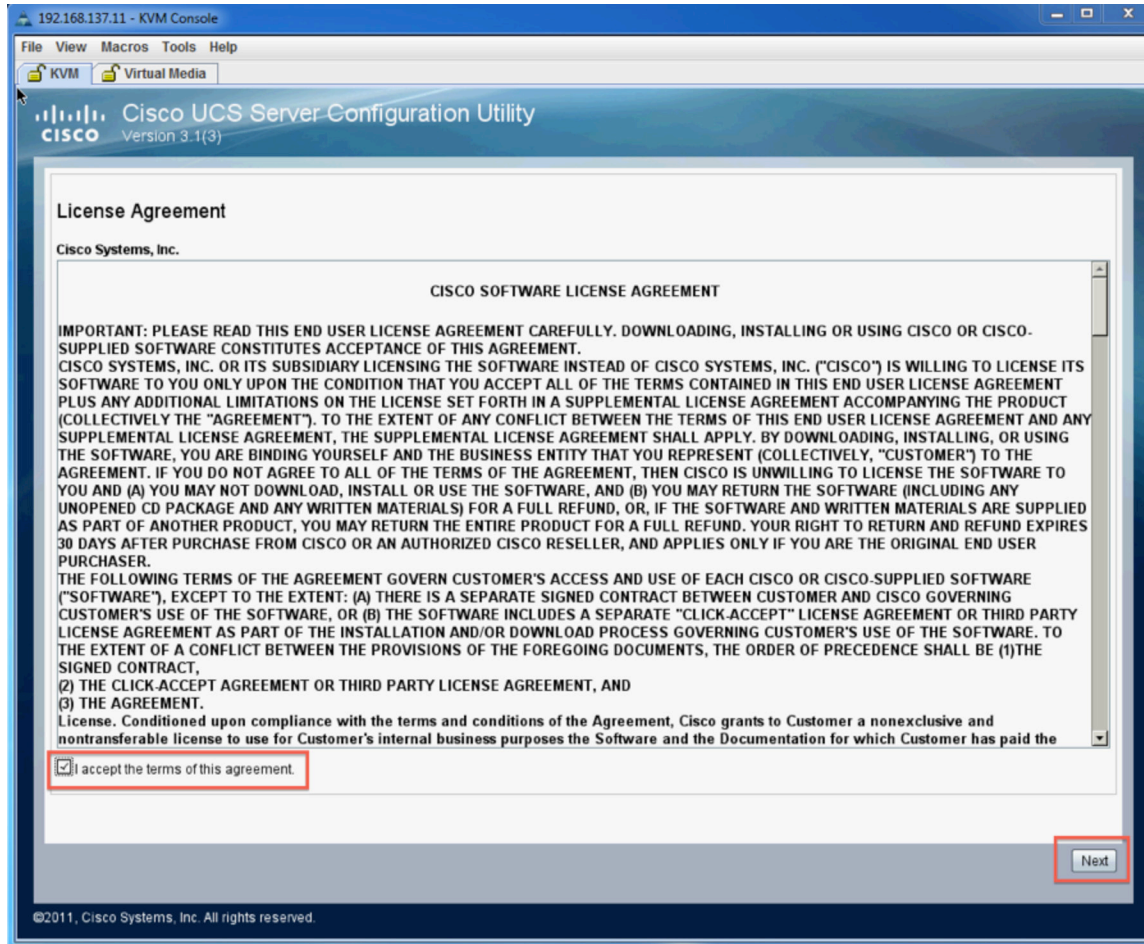
When you choose the HUU partition as the boot device, the system loads the HUU ISO from the partition. The HUU partition contains the bootable HUU ISO. This image is used to update the Cisco IMC software, the server BIOS, and the adapter firmware versions. You must first enable the HUU partition in Cisco FlexFlash, as shown in Figure 14.

Figure 14. Enabling the HUU Partition



Now select that partition for boot using one of the methods described previously. The software will load, and you will be prompted to accept the EULA, as shown in Figure 15.

Figure 15. HUU EULA

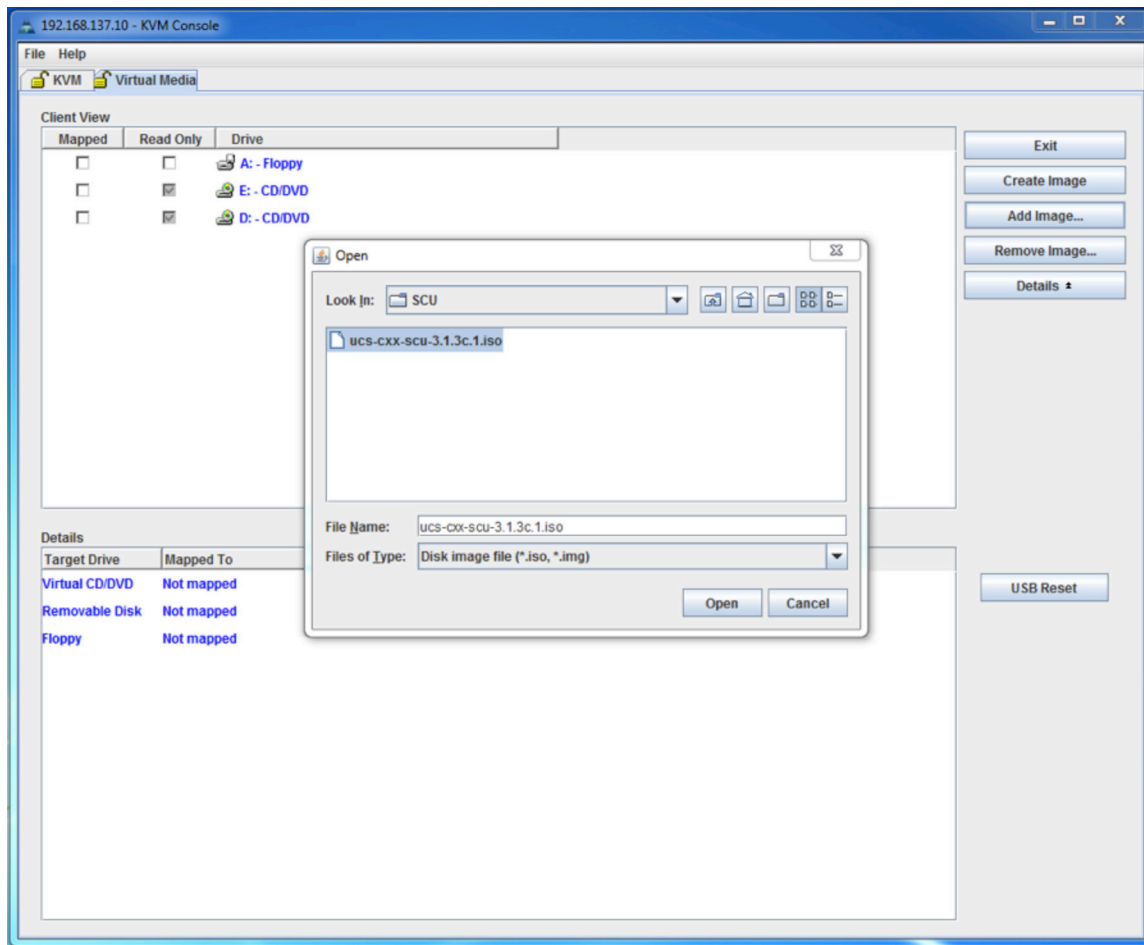


After you accept the EULA, the HUU will open for use. Follow the on-screen prompts to update the Cisco IMC firmware, server BIOS, and selected adapter firmware.

Managing Cisco FlexFlash SD Cards

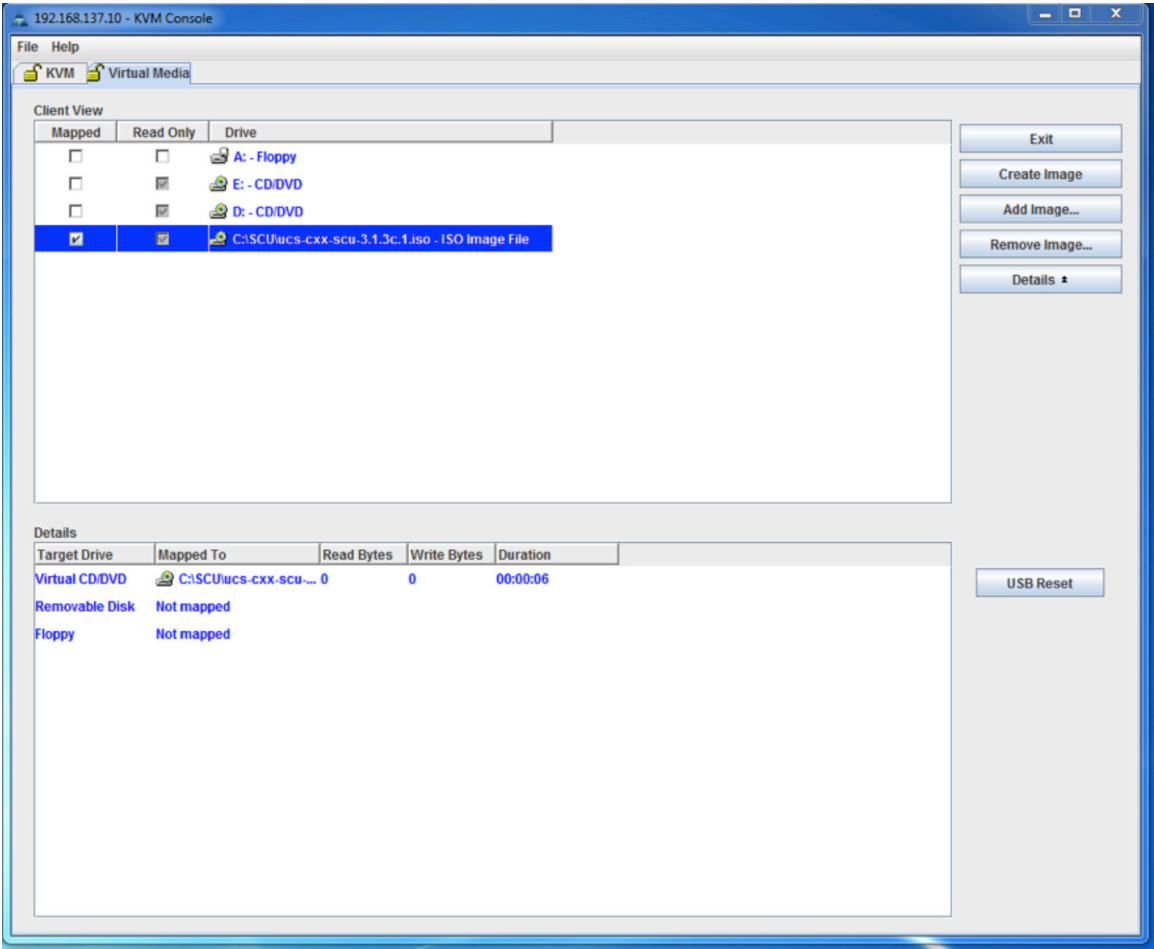
When you order a Cisco FlexFlash card as an option with a Cisco UCS C260 M2, C420 M3, C240 M3, or C220 M3 server, the card will come with the latest (at the time of shipping) HUU, SCU, and Drivers images preinstalled from the factory. Depending on the timing, these may or may not be the latest images. If you order a blank Cisco FlexFlash drive as a spare, or if you receive a Cisco FlexFlash replacement from Cisco support, the card will be blank. You can order a spare Cisco FlexFlash drive that has the latest HUU, SCU, and Drivers images preinstalled from the factory as well. You can find part numbers for these spares in the product [Technical Specifications](#) documents. Also, sometimes a partition may become corrupt or damaged. To manage a blank card or recover a damaged partition, boot to the SCU and access the Cisco FlexFlash update utility. If the card is new, or if you do not have a working SCU partition on the card, you will need to download the SCU ISO from [Cisco.com](#). After you have downloaded it to the workstation you are connecting to the KVM, select the Virtual Media tab on the KVM and then click Add Image. Navigate to the image on a storage device that is accessible to the workstation on which you are running the KVM utility, as shown in Figure 16.

Figure 16. Locating the SCU ISO on the KVM Workstation



Select the image and click the Open button; the image will be added to the list of available drives in the virtual media. Then select the Mapped box at the left of the window to make the ISO available for boot on the server, as shown in Figure 17. After you have completed this task, you can reboot the server. Make sure that the CD/DVD option is first in the boot order, or press F6 during boot and choose the Cisco Virtual CD/DVD option to boot to the SCU from the virtual media.

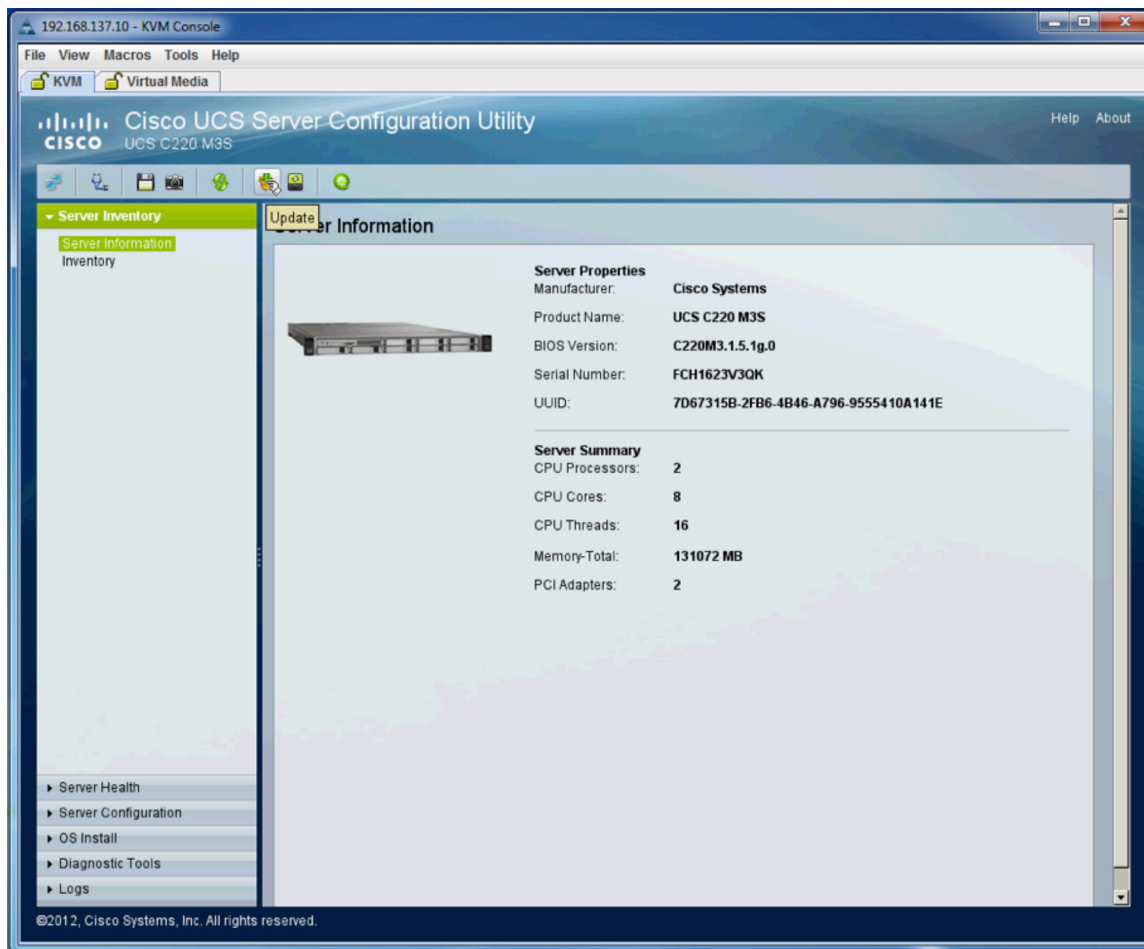
Figure 17. Mapping the SCU ISO in Virtual Media



Managing a Blank Card or Recovering a Partition

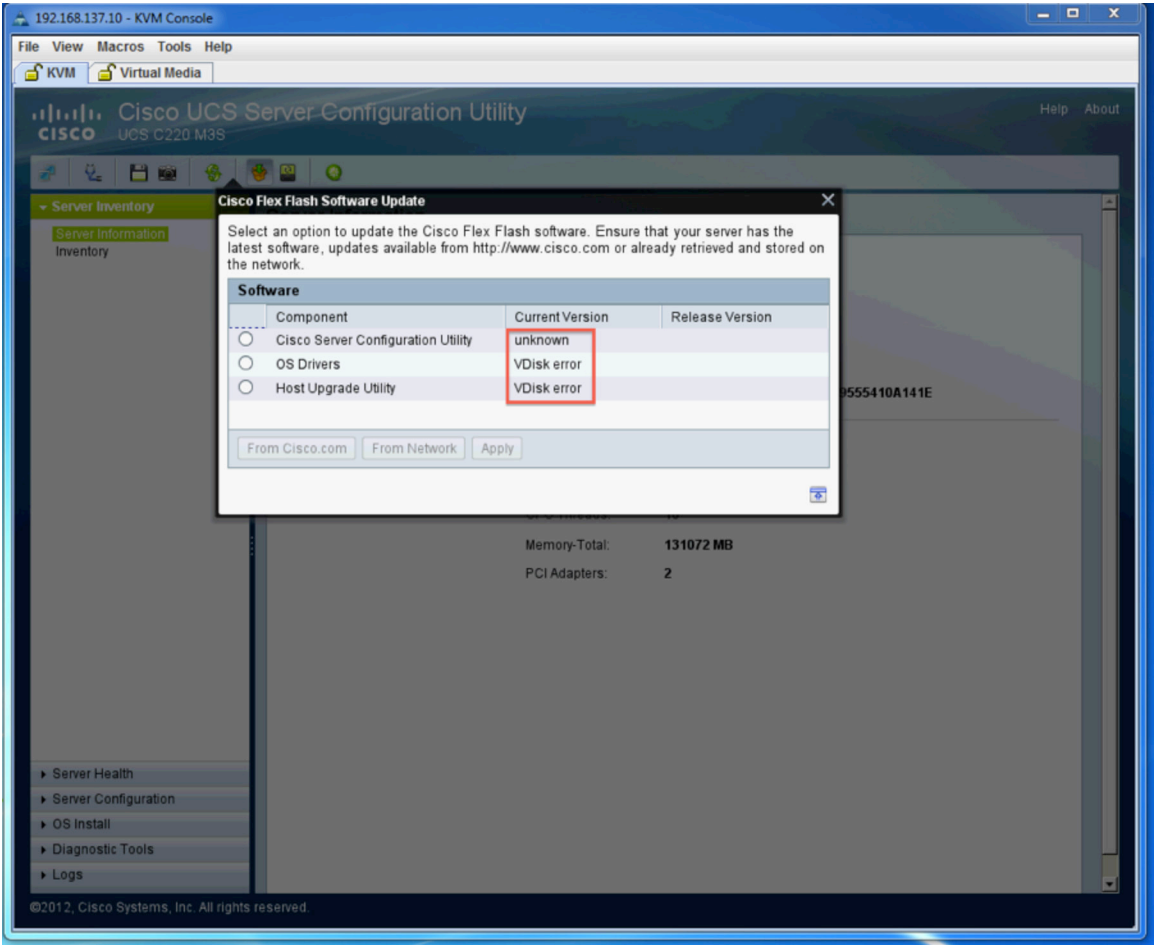
After the SCU boots, select the Update tool from the toolbar menu, as shown in Figure 18. If you have not enabled the partitions, you will receive an error message reporting that the tool cannot enumerate the virtual disks (vDisks). This error indicates either that the card is not installed in the system or that the partitions have not been enabled in the operational profile of Cisco IMC. If none of the partitions are enabled, you will need to enable them in Cisco IMC and select the Update tool again. There is no need to reboot the server in this case; however, if you have only one of the partitions enabled but need to manage all of them, you will have to enable all the partitions in Cisco IMC, then reboot the server into the SCU and run the Update tool again to see the partitions. Note: The HV partition is not managed by the Update tool and will not show up if enabled.

Figure 18. Selecting the Update Tool in the SCU



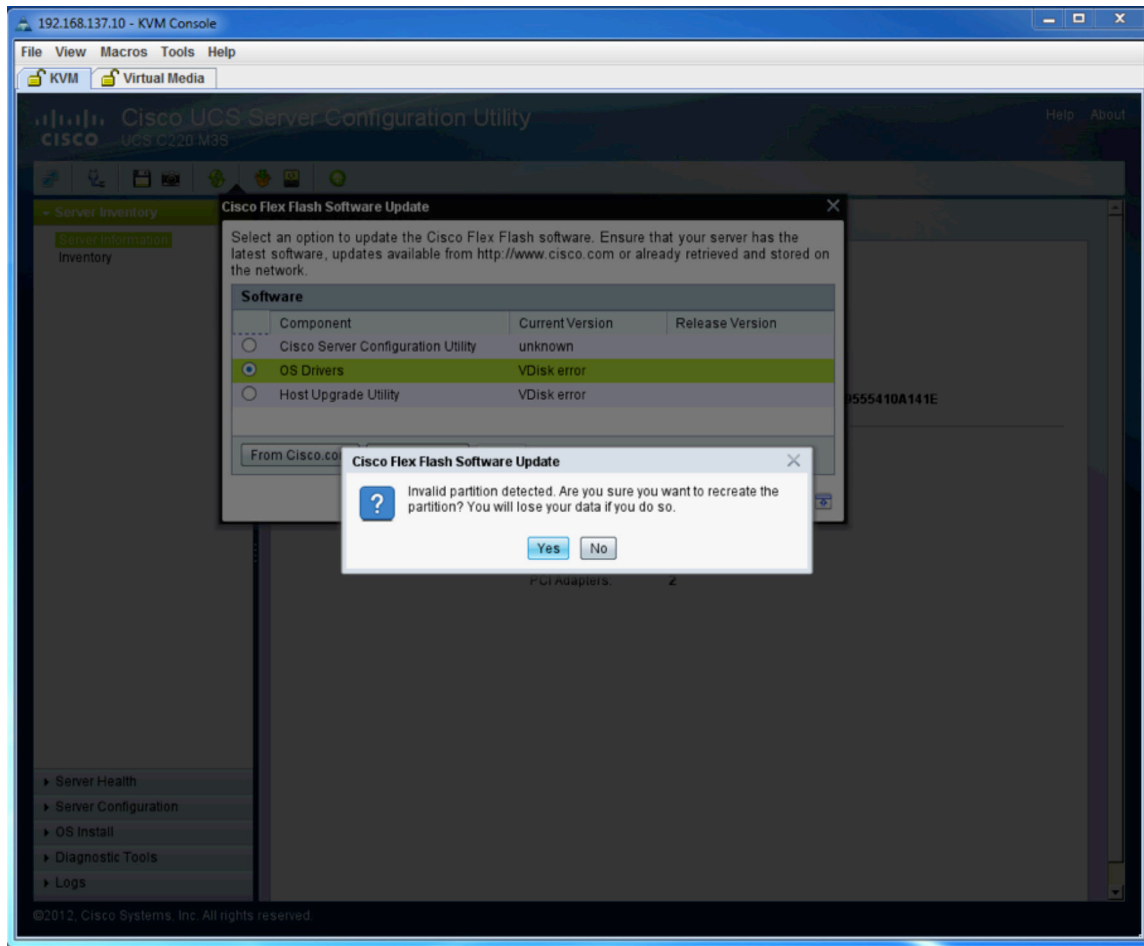
The Update tool will display all the partitions enabled in Cisco IMC, along with the current versions of the utilities or ISOs loaded. If the drive is blank or if errors occur, you will see “unknown” or “VDisk error” in the Current Version column, as shown in Figure 19.

Figure 19. Errors Indicated for a Blank SD Card



To recover a partition, click the radio button for the partition. The tool will then inform you that the partition is corrupt and ask if you want to re-create it, as shown in Figure 20. To re-create the partition, click Yes.

Figure 20. Recovering the Partition



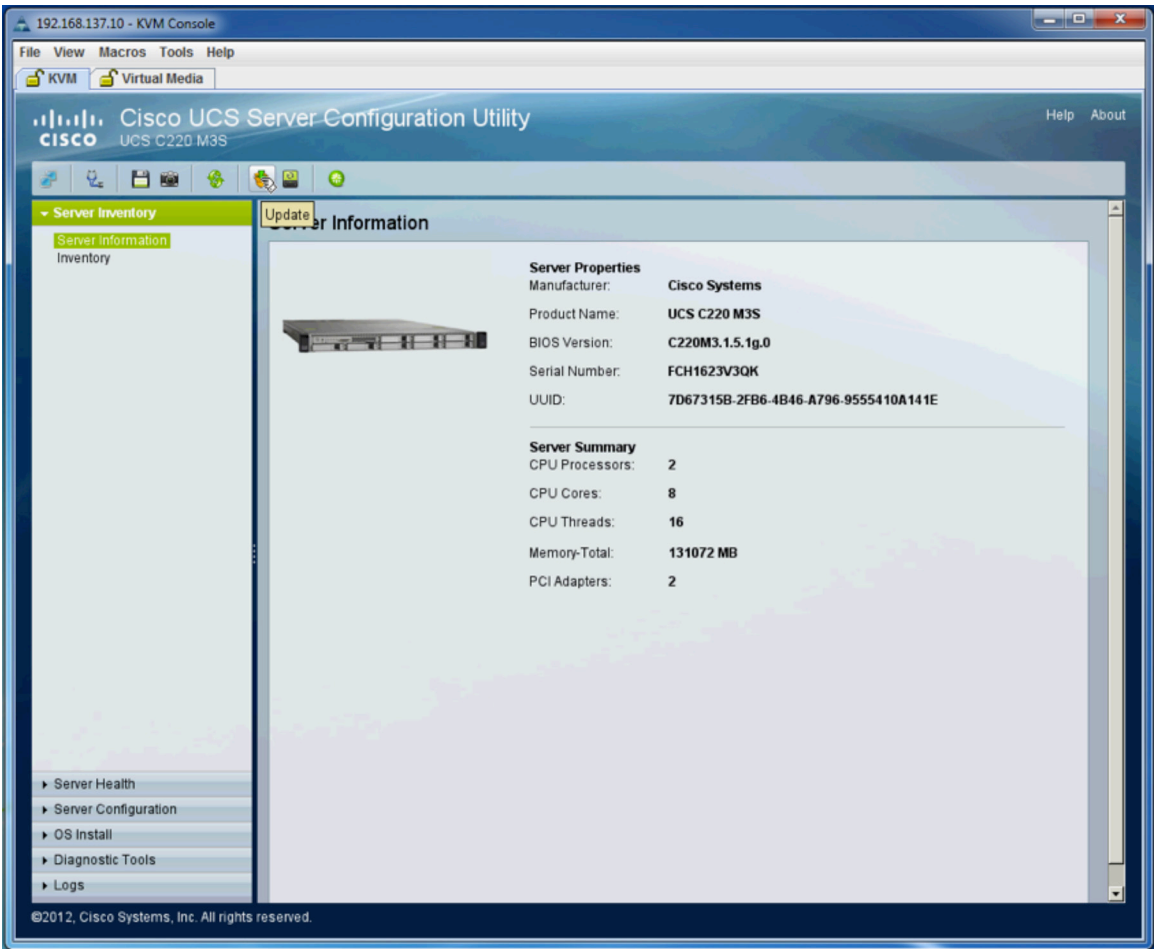
After the partition has been recovered, you will receive a notification, and the partition will again be manageable from the SCU. Complete this task for each partition that reports an error. If the SD card is blank, all partitions will be marked with an error.

Updating Images on Cisco FlexFlash Partitions

When the server is delivered, it will have the same Cisco IMC, BIOS, and firmware versions installed on Cisco FlexFlash as are loaded on the system. To update the three read-only partitions, you can use a special utility in the SCU to load newer images from an ISO file that is available from a network share or through Cisco.com, using the end-users credentials for logon.

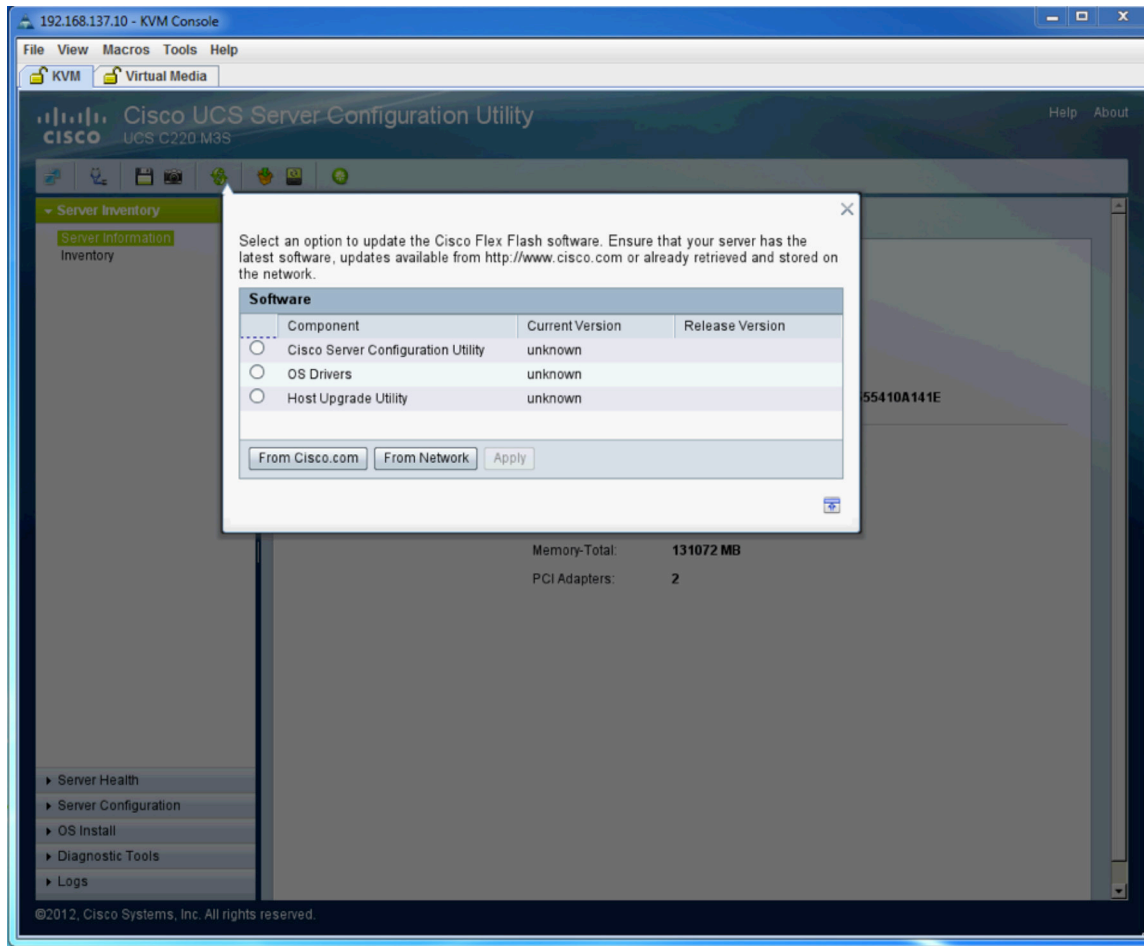
To update the images on Cisco FlexFlash, load the SCU and then click the Update icon in the SCU toolbar menu, as shown in Figure 21.

Figure 21. Selecting the Update Tool in the SCU



The Update tool will open and will list the currently enabled drive partitions and the current images loaded on those drive partitions, as shown in Figure 22. If the card is blank, the Current Version column will show “unknown,” as indicated in Figure 22.

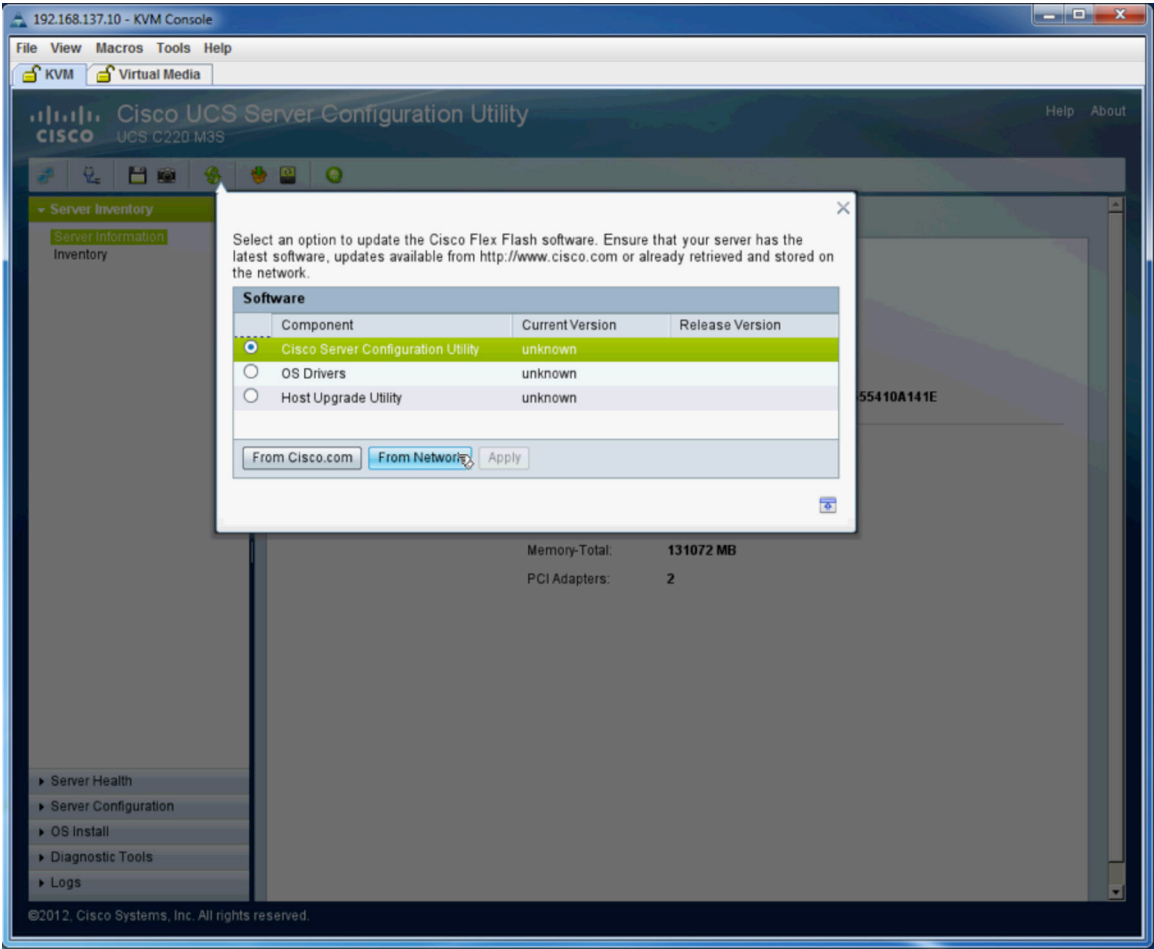
Figure 22. Viewing Partition Information



Select the partition that you want to update, and select the location from which you want to perform the update. Your options are Cisco.com or a local network share that contains the ISO. Because the SCU will be using the network, you will be prompted to configure the network settings for the SCU after you make a selection here. These settings will include the Dynamic Host Configuration Protocol (DHCP) or static address, proxy settings, and Cisco.com credentials (if needed) for the SCU to connect. The interface used by the SCU will be the LAN-on-motherboard (LOM) ports for the system.

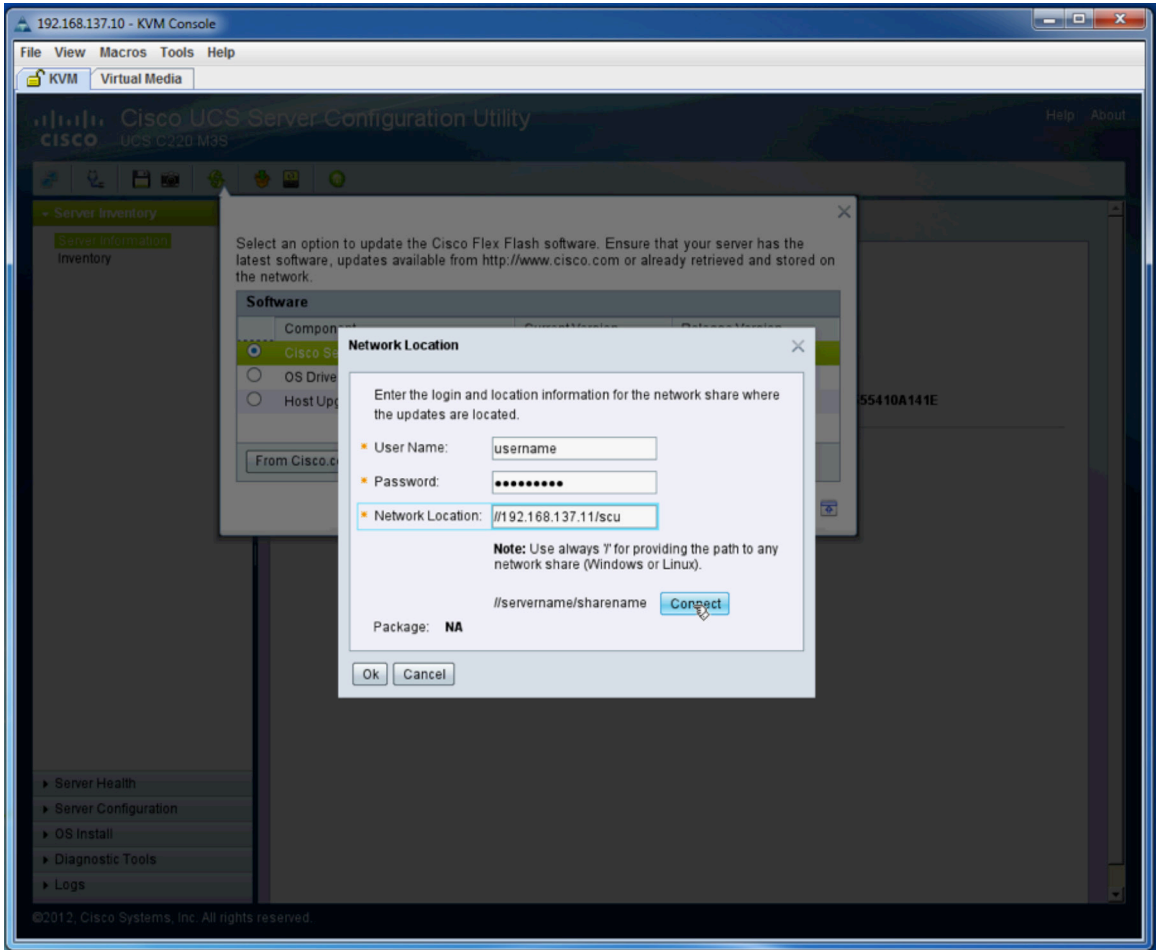
The example here uses the local network. It assumes that you have the SCU, HUU, or Drivers ISO that you downloaded previously on a local network share (this approach can be useful if you are upgrading the partitions on multiple servers, because the image will not have to be transferred across the Internet each time). Click From Network to select the local network option, as shown in Figure 23.

Figure 23. Network Update



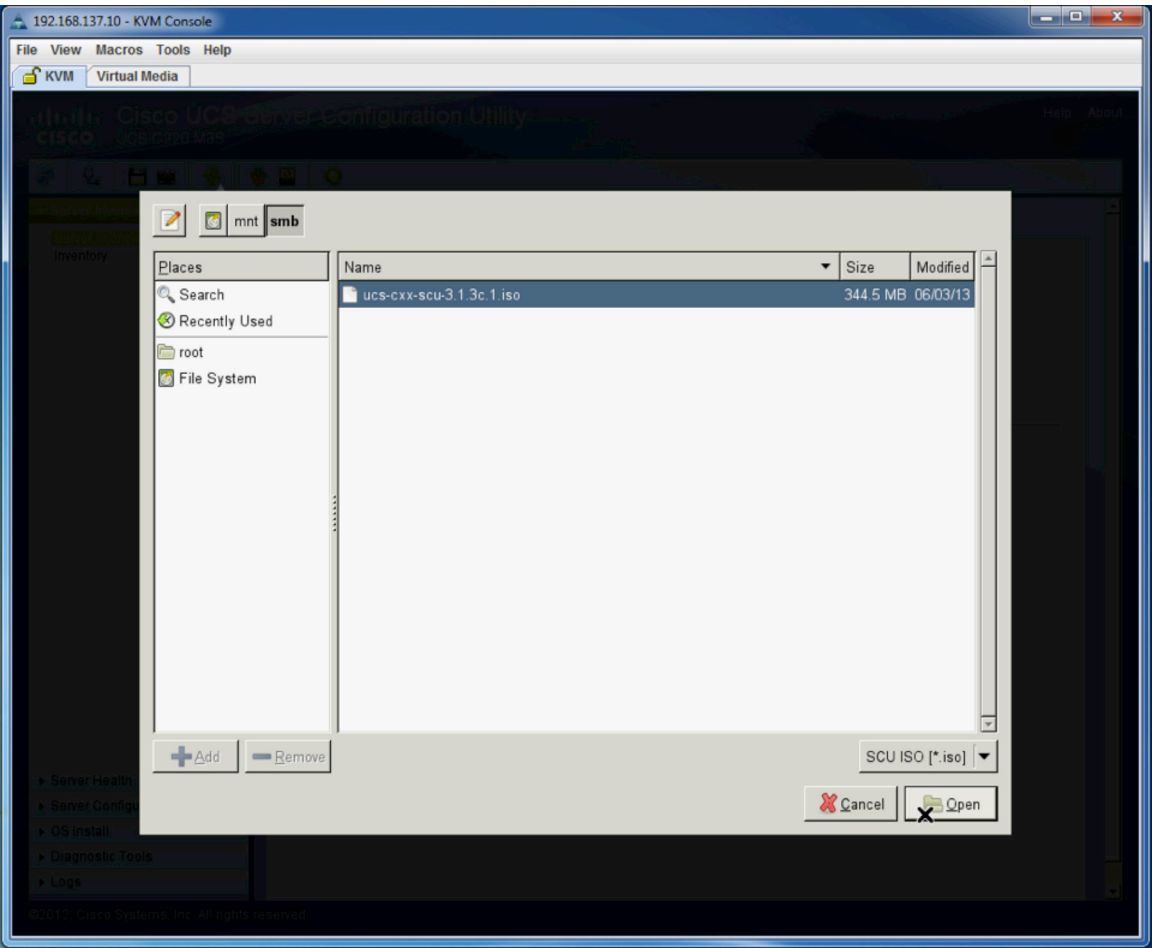
Next, provide the path to the network share, along with login credentials for that device, as shown in Figure 24.

Figure 24. Network Share and Credentials



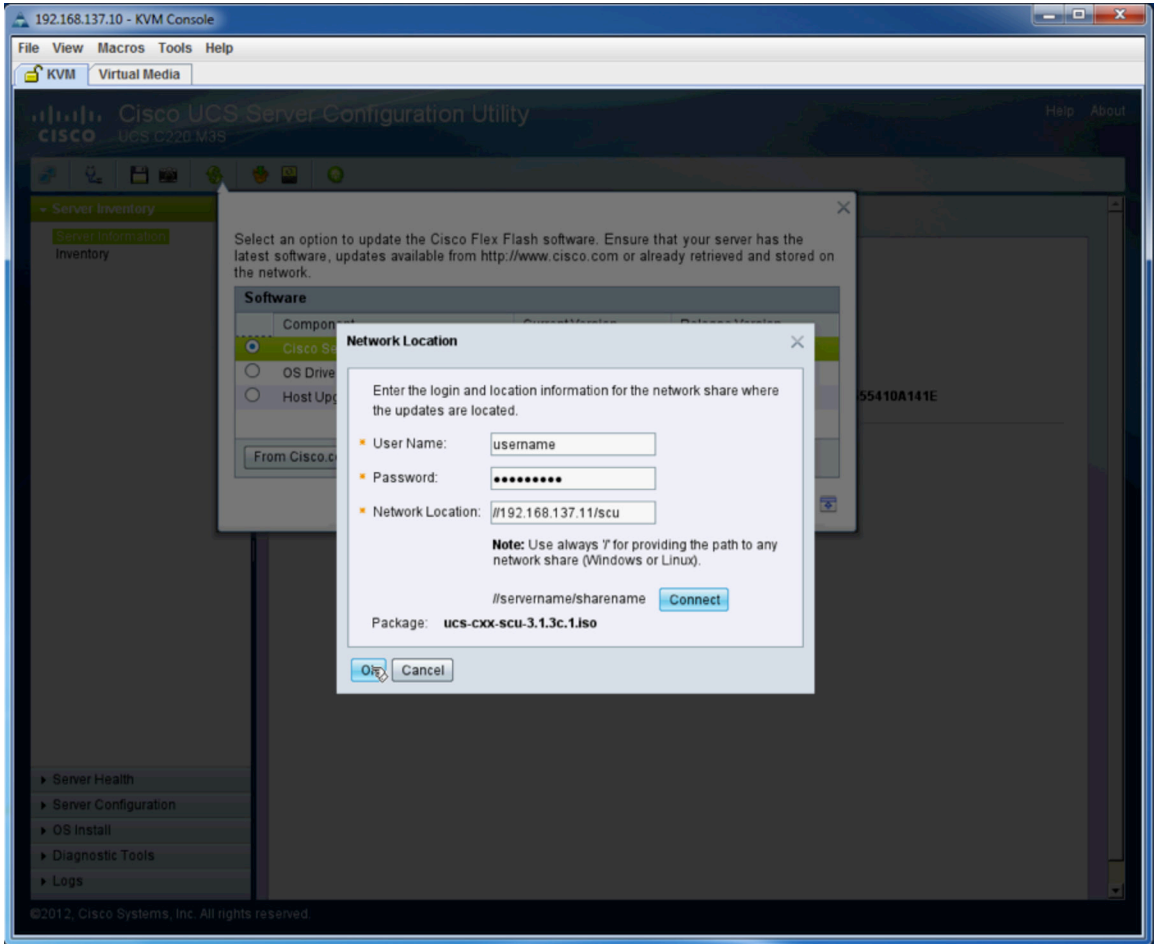
Select the ISO file that you want to install on the partition, as shown in Figure 25.

Figure 25. Selecting the Partition ISO



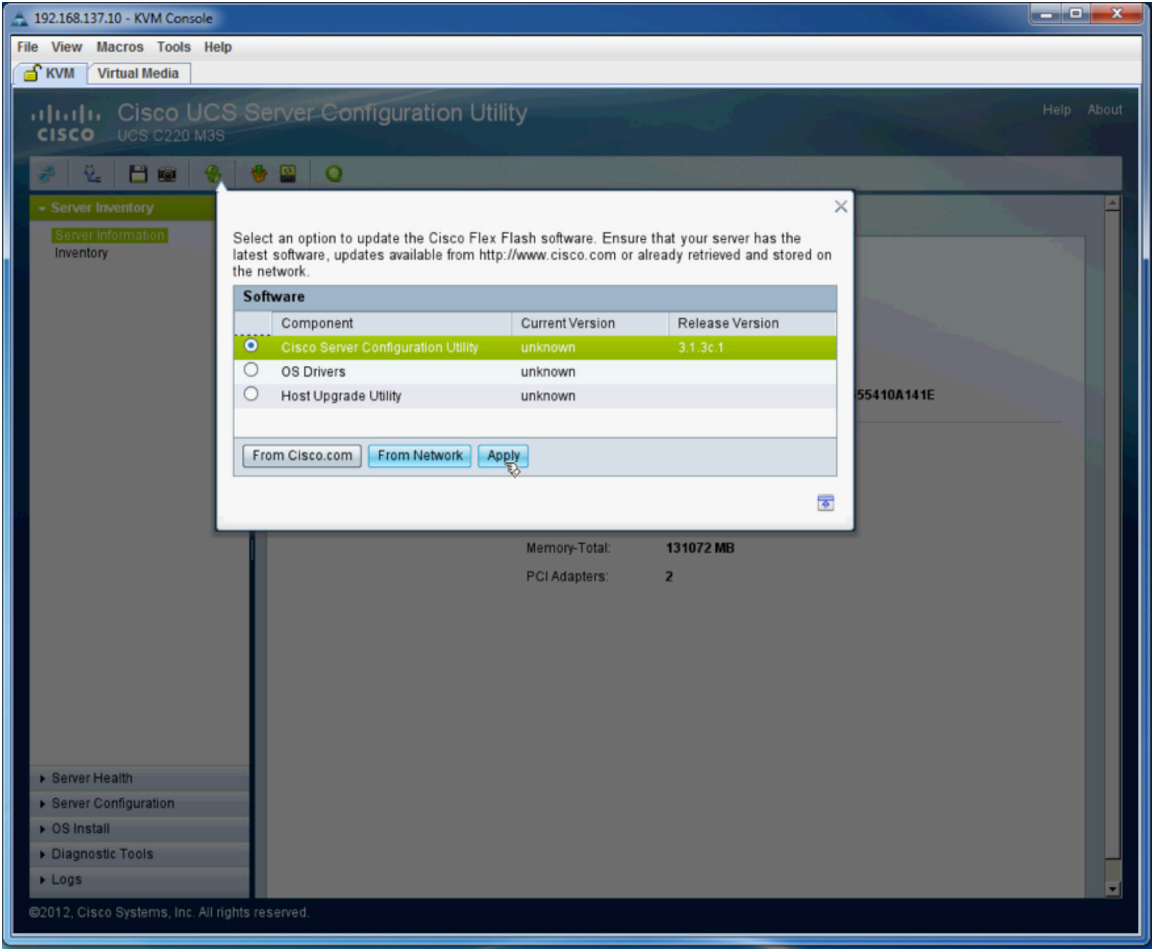
Verify the package you have chosen; after you select the image, click OK, as shown in Figure 26.

Figure 26. Verifying the Image Package



You will be returned to the tool, and the version that you have selected will be displayed. Click Apply, as shown in Figure 27, to load the image. A copy operation from the network to the server will begin.

Figure 27. Applying the Update



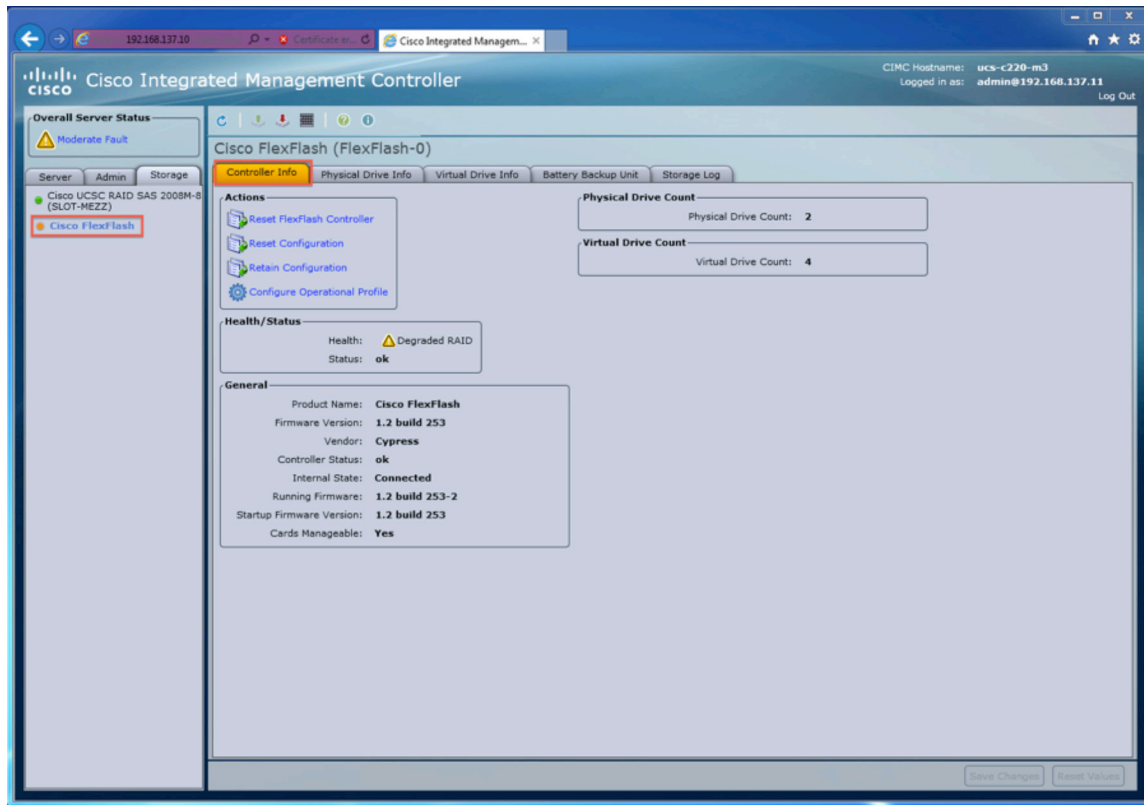
After the file has been copied, the SCU will write it to the Cisco FlexFlash partition.

Repeat this process for each image that you want to change. Note that you can choose an older or newer image as long as it matches the partition type selected.

Synchronizing and Managing the RAID Partition

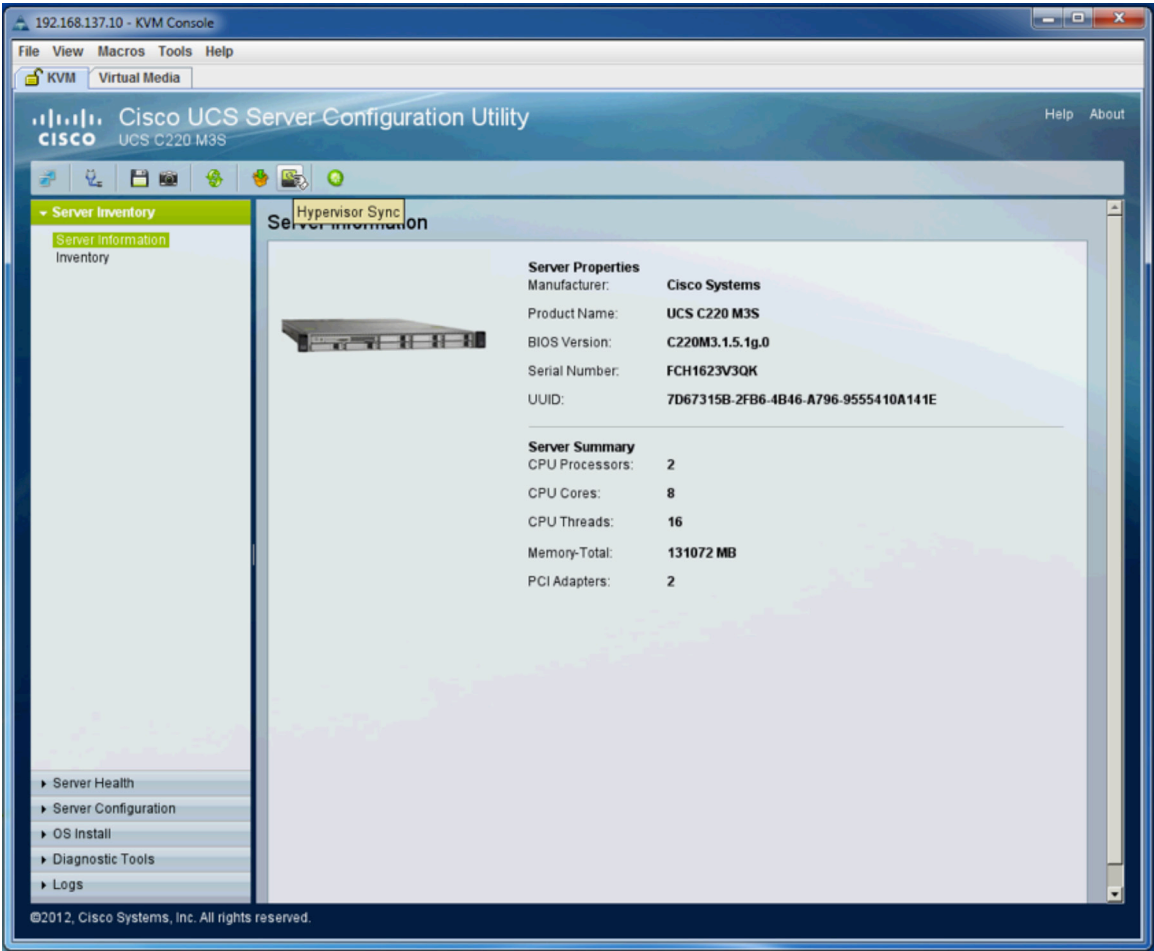
Beginning in Cisco IMC version 1.5(1) you can install two SD cards in the system. The second SD card will be used to provide a mirror of the user space (HV) partition only. This provides a failover mechanism for continuing to run on the second card if the first card fails. Figure 28 shows Cisco IMC with a degraded RAID, indicating that the HV partition is not synchronized. Note that the Controller Info tab is orange, as is the Cisco FlexFlash indicator in the right pane. This is a noncritical error and will also show up if you have only one SD card installed. There is no requirement for any PCIe RAID cards or special configuration by the user other than what is detailed here. The SD RAID is facilitated by the onboard SD controller that ships with servers that support FlexFlash. If your server is ordered with two SD cards installed, the RAID synchronization will be initialized at the factory prior to shipping.

Figure 28. Degraded RAID



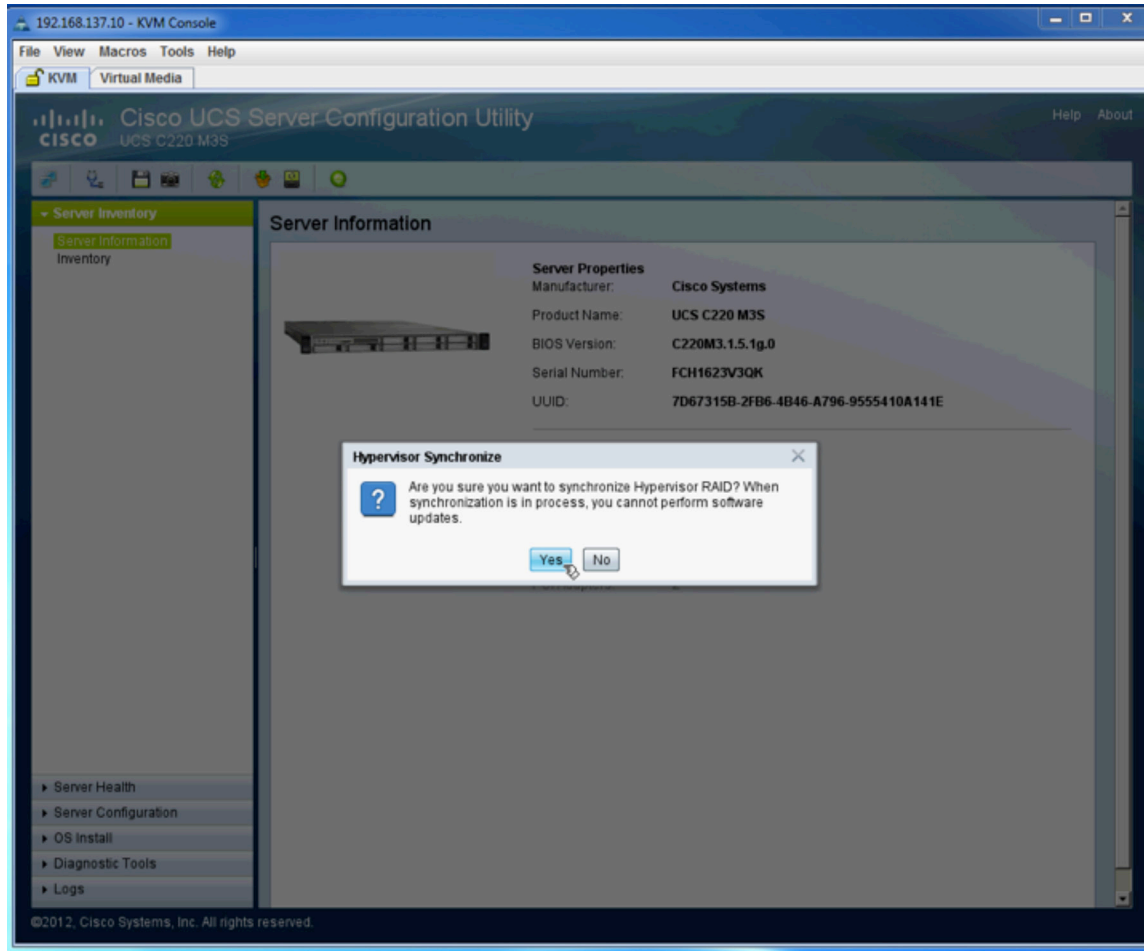
To clear this error and synchronize the cards, you will need to boot the host into the SCU, as detailed in a previous section. Once you have booted into the SCU, you can synchronize the cards and clear the error by selecting the Hypervisor Sync tool from the toolbar in the SCU, as shown in Figure 29.

Figure 29. Synchronizing RAID on the SD Cards



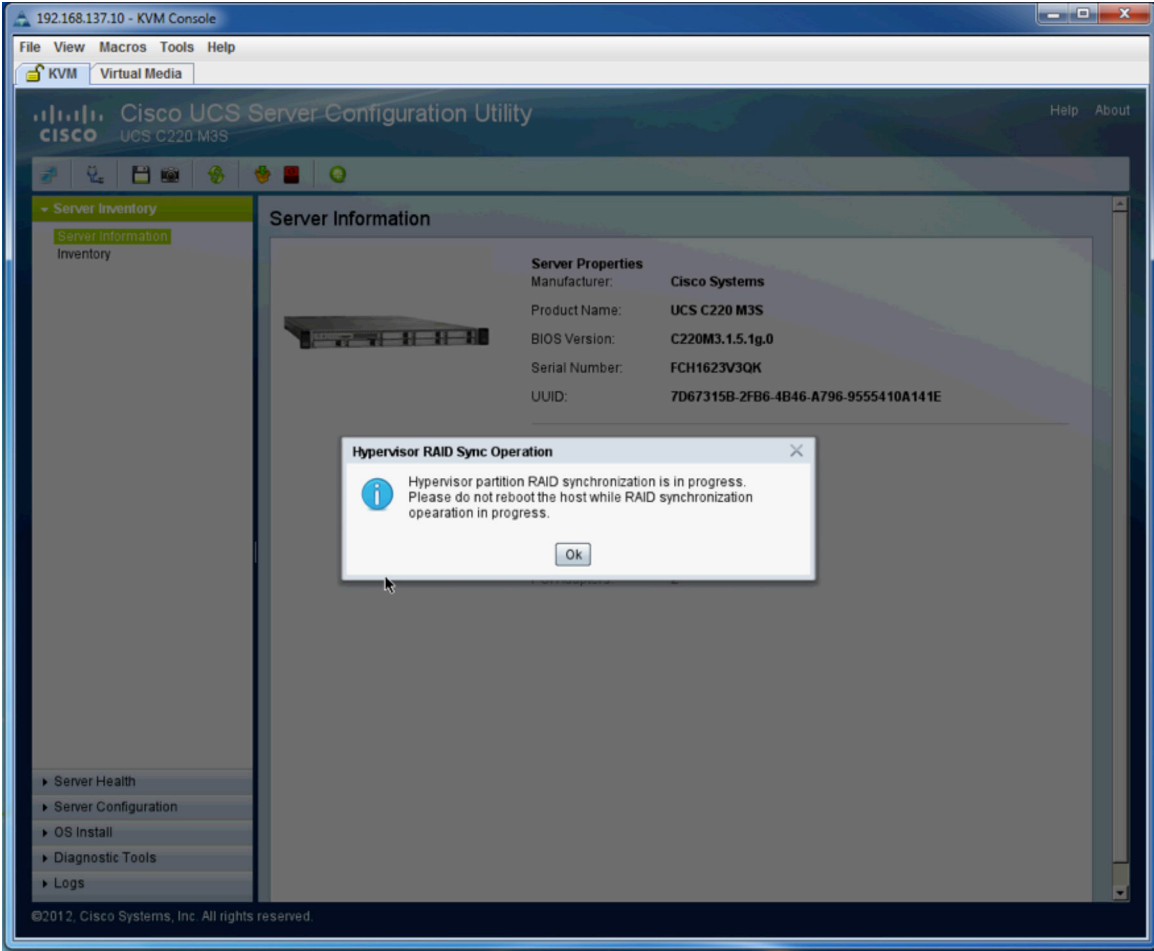
Click the Hypervisor Sync button, and then click Yes, as shown in Figure 30. Note that you cannot perform updates to the partition while the synchronization process is taking place.

Figure 30. Starting the Synchronization Process



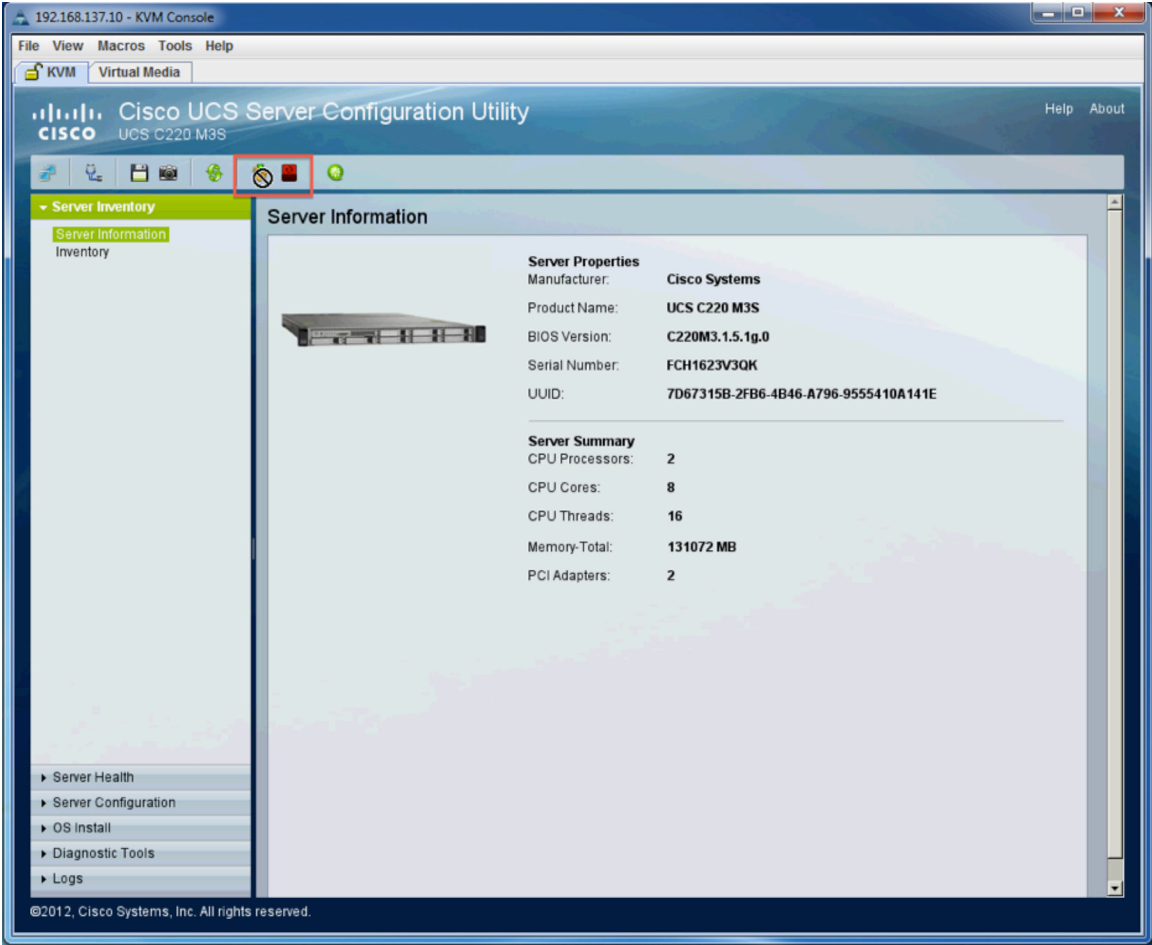
After the process initializes, you will be prompted with the message shown in Figure 31, indicating that the synchronization has started. Click OK. Note: Do not reboot the system during the synchronization.

Figure 31. Confirming the Synchronization



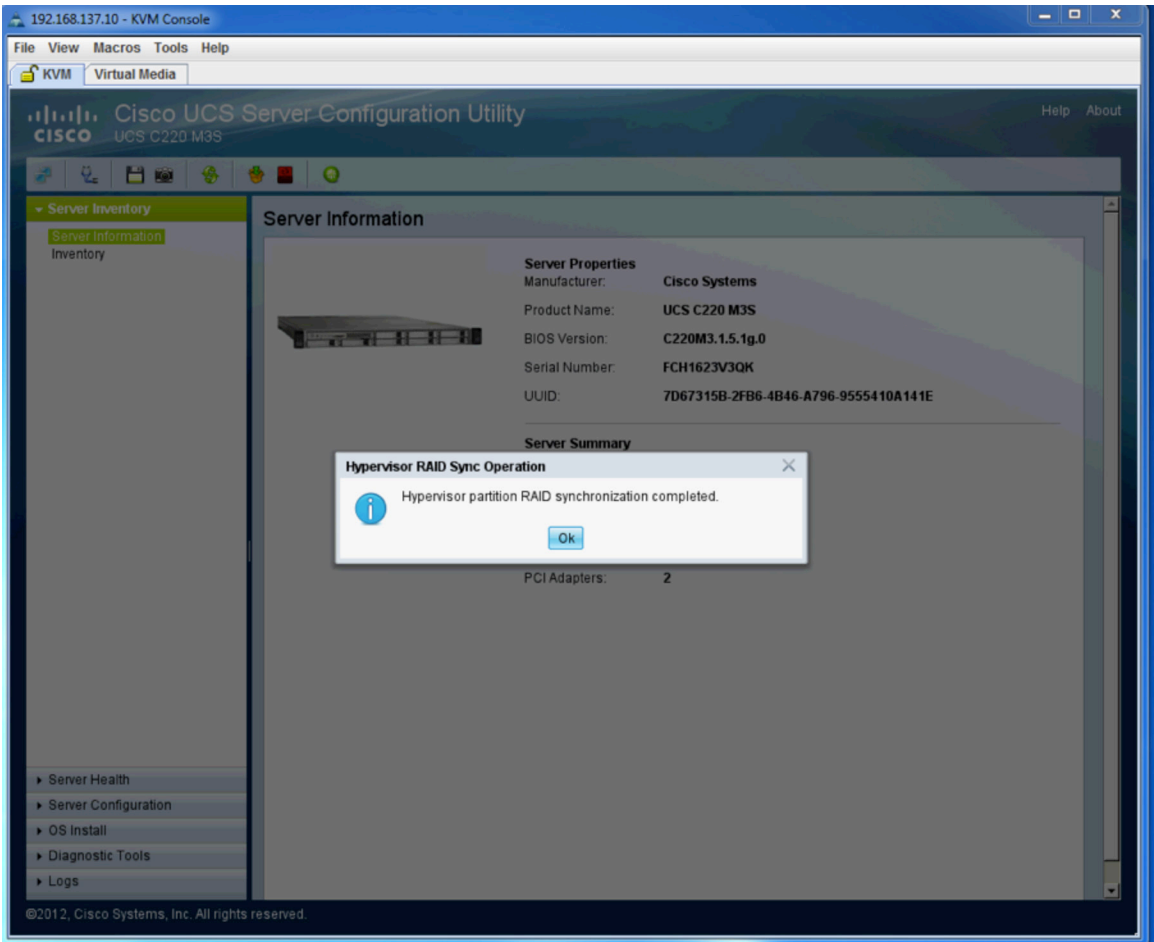
During the synchronization process, the Hypervisor Sync button will turn red, and you will not be allowed to click on the Update tool, as you can see if you hover the mouse over the Update button. Both of these items are shown in Figure 32.

Figure 32. Sync in Progress



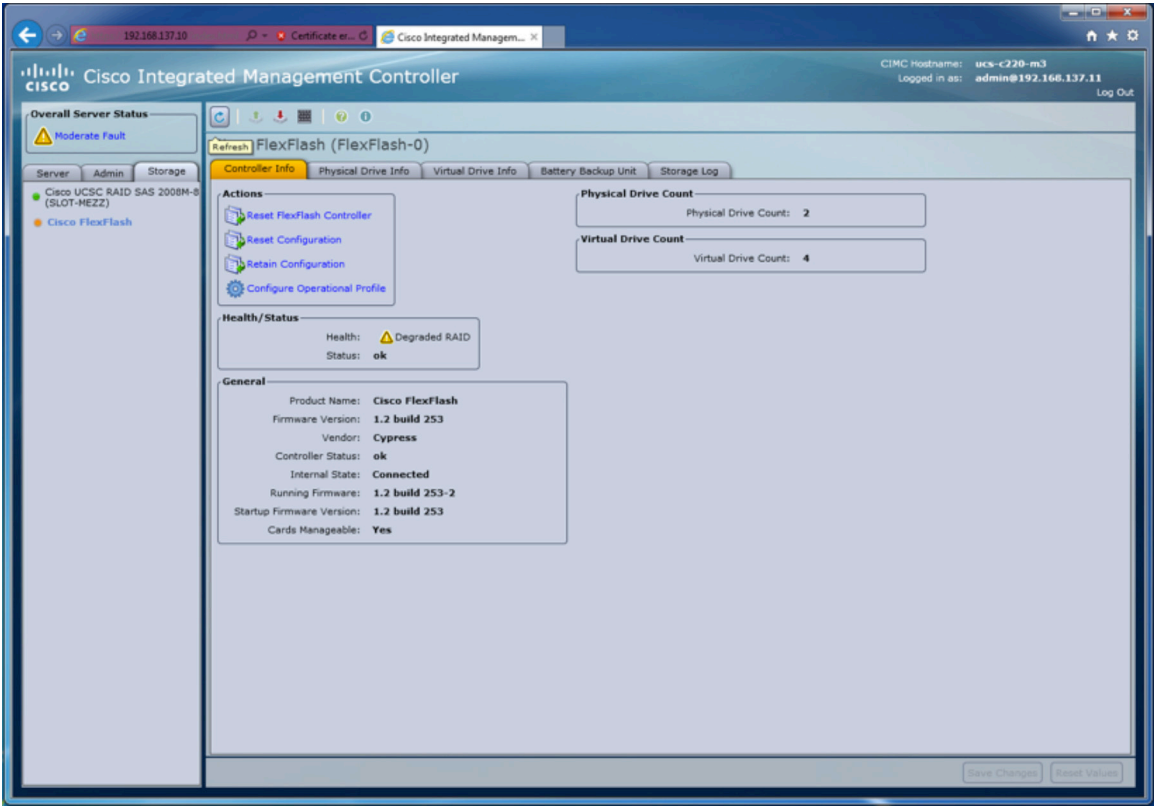
You will be notified once the synchronization is complete, as shown in Figure 33.

Figure 33. Sync Complete.



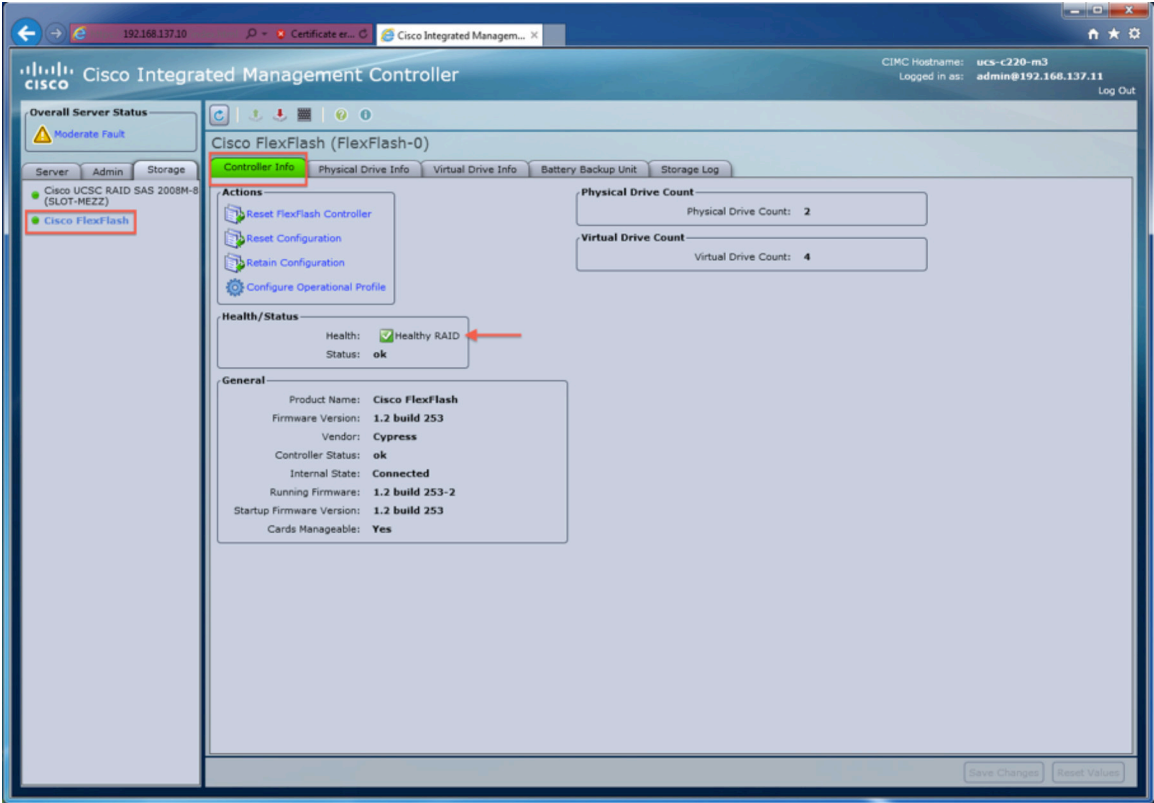
Return to Cisco IMC and click Refresh on top of the toolbar, as shown in Figure 34.

Figure 34. Refreshing Cisco IMC



After the refresh, the Health/Status section will change to indicate Healthy RAID, and the Controller Info tab and FlexFlash indicator in the left pane will turn green, as shown in Figure 35.

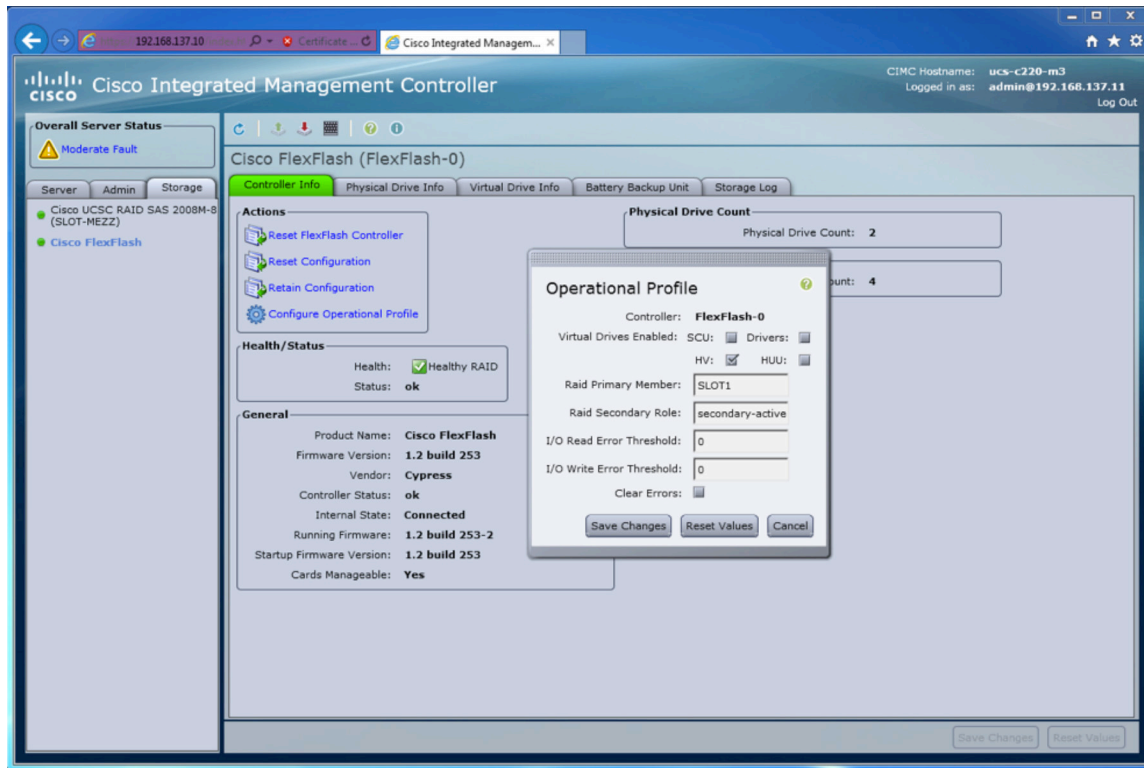
Figure 35. Healthy RAID.



Using the Hypervisor User Space

The HV partition can be used by the end user for a variety of purposes. This partition is writable and is presented to the OS and BIOS as a USB drive. It can be used to store files that can be accessed by the OS, and because access is controlled through Cisco IMC, a system administrator can use it to store utilities or images that may be needed for regular or maintenance. One common use for this partition is for the installation of a bootable hypervisor such as VMware ESXi. Before you begin the installation process, verify that the HV partition is enabled in Cisco IMC, as shown in Figure 36.

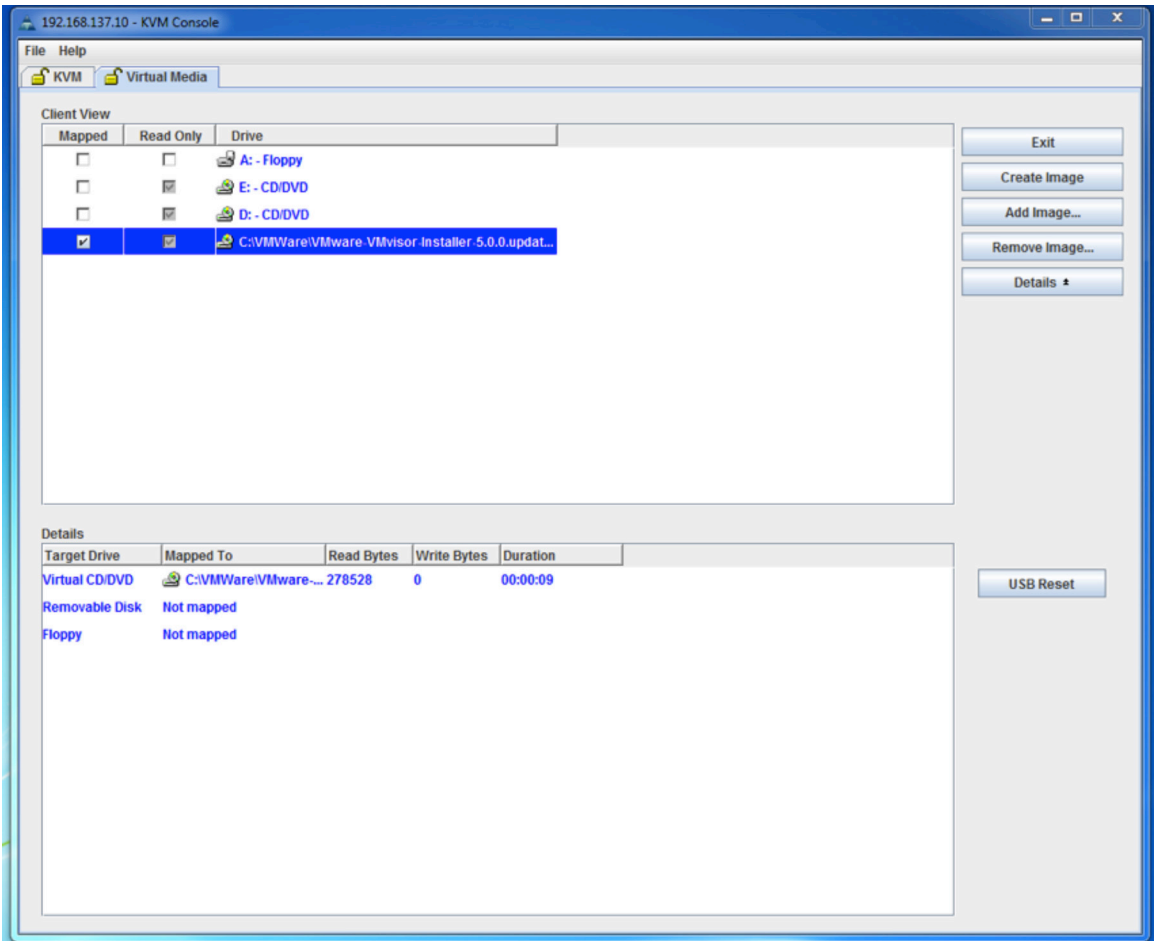
Figure 36. Enabling the HV Partition



Installing VMware ESXi on Cisco FlexFlash

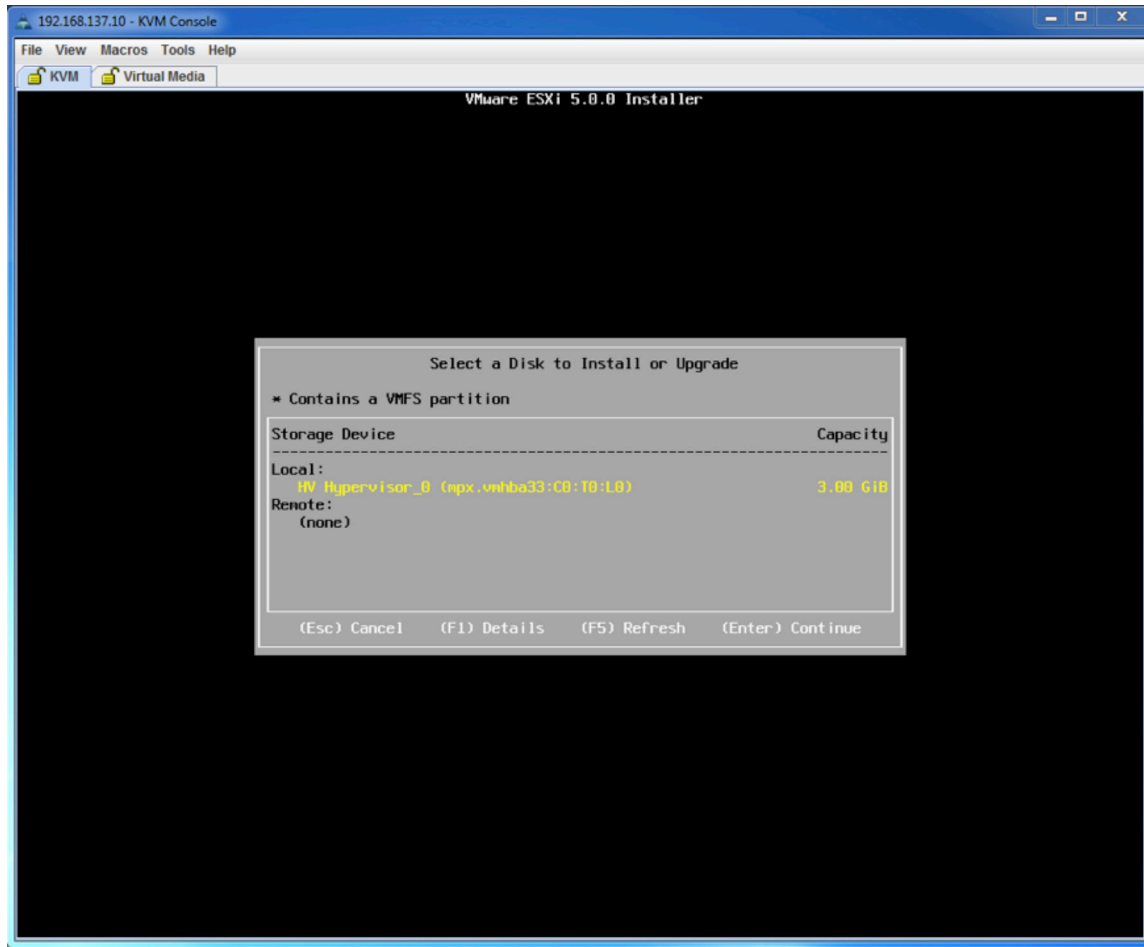
To install VMware ESXi on the activated HV space, open a KVM session to the server and select the Virtual Media tab to mount an image to begin the installation. Add the image of the installed ISO and map it, as shown in Figure 37, and boot the server.

Figure 37. Mapping the VMware ESXi ISO



Proceed through the installation screens for VMware ESXi. When you reach the screen asking you to select a disk for installation, you will see the HV Hypervisor space listed in the Local section, as shown in Figure 38. Select this drive and continue the installation. Note: If you have multiple partitions enabled in Cisco IMC, they will also show up as local drives. Only the HV partition is supported for user-installed applications, and only the HV partition is mirrored between the two SD cards.

Figure 38. Choosing the HV Partition as the Installation Location



After you have installed your software, you will need to configure the server to persistently boot from the HV partition in the BIOS. See “Configuring the Boot Order in the BIOS Setup” earlier in this document for directions to accomplish this.

Cisco FlexFlash Physical Locations

The following Cisco UCS C-Series servers have Cisco FlexFlash capabilities: Cisco UCS C220 M3, C240 M3, C420 M3, and C260 M2. These servers have two SD slots; however, only one card is currently supported by Cisco IMC. The Cisco FlexFlash SD slots are located on the PCI Express (PCIe) riser assemblies in each server. Please see the following links for information on the physical SD location:

- [Cisco UCS C260 M2](#)
- [Cisco UCS C220 M3](#)
- [Cisco UCS C240 M3](#)
- [Cisco UCS C420 M3](#)

Cisco FlexFlash Q&A

Q. Can users write to any of the partitions on the SD card?

A. No. Only the HV space is supported for read-write operations by the user.

Q. How do I erase information that I have put on the HV space?

A. Erasing information from the HV space is accomplished through an OS that can read the file system formatted on that space (Microsoft Windows, Red Hat Enterprise Linux, etc.).

Q. I noticed that the servers have two SD slots. Does this mean that I can mirror the physical drives?

A. Yes. This feature was enabled in Cisco IMC version 1.5(1).

Q. Can I access Cisco FlexFlash if my server is integrated with Cisco UCS Manager (UCSM)?

A. Yes. This feature was added in UCSM version 2.1(2).

Q. Can the HV space be used only for a hypervisor?

A. No. The HV space is available as a drive for the end user to use in any way that the user wants.

Q. Will all future Cisco UCS C-Series server models have Cisco FlexFlash as an option?

A. No. Some entry-level servers, such as the Cisco UCS C22 and C24 M3 Rack Servers, will not have Cisco FlexFlash, but they will have an internal USB drive with the same utilities and tools. Higher-end servers will continue to have FlexFlash as an option.

Q. My SCU partition is corrupt or blank; how can I recover my Cisco FlexFlash without a bootable SCU partition?

A. The SCU is available for download as a bootable ISO from Cisco.com. Download the image, mount it with vMedia, and run the Update tool to recover the Cisco FlexFlash drive.

Q. What does the Reset option in the Actions box under the controller in Cisco IMC do for Cisco FlexFlash?

A. This option resets the controller that provides the interface between the SD card and the BIOS. If there are problems using the card, this option can be used to reset the controller without a system reboot.



Q. I have an error on the FlexFlash indicating “Degraded RAID.” What does this mean? Will my system operate properly?

A. Starting with Cisco IMC version 1.5(1) you can install two SD cards and mirror the HV partition only. If a second SD card is not installed, if a second card is installed later, or if you have a failure and need to replace a card, the RAID will not be synchronized and must be synchronized using the SCU utility. The system will continue to operate with this error. In a future release of Cisco IMC firmware, you will have the option to disable this fault message if you want to run the server with a single SD card.

Q. Can the partition sizes be altered?

A. No. The partitions are hard coded into the controller and cannot be altered by the user.

Q. Can I install a third-party card SD card into the server?

A. No. Third-party cards are not qualified for use in the FlexFlash slots.

Q. Would a larger SD card provide more user space?

A. No. The HV partition is hard coded into the controller, and installing a larger card will not yield any more space for the partition. Furthermore, the supported SD card is 16 GB, and installing a larger third-party card is not supported.

Q. Will there be any larger card options in the future?

A. Cisco is constantly evaluating market trends and customer use cases of technology such as Cisco FlexFlash. It is conceivable that we may offer additional card options at some point in the future.

Q. Does the server have to have a RAID card installed for the RAID feature to work with FlexFlash?

A. No. The FlexFlash controller is built into all systems that provide this as an option. The RAID functionality between the cards is handled by the FlexFlash controller, and there is no need for a PCIe RAID controller.

Q. Can I configure a RAID 0 between the cards to increase the size of the partition?

A. No. The controller provides only the ability to mirror the HV partition on the SD cards. This feature is hard coded into controller and is enabled in the factory or through the use of the SCU, as outlined in this document.

For More Information

Read more about the [Cisco UCS C-Series Rack Servers](#), or contact your local account representative.



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